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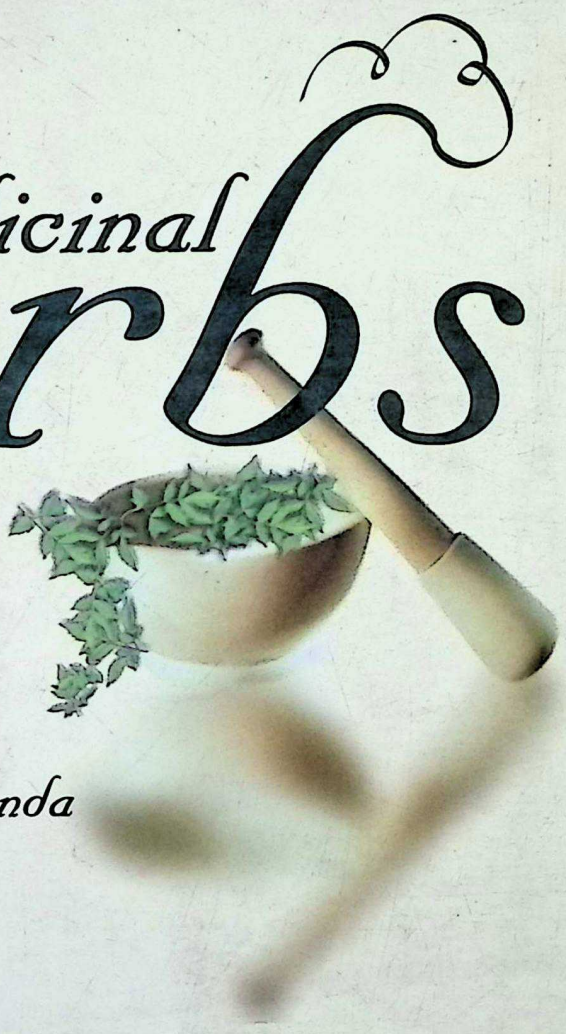
Medicinal Herbs with their formulations



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VOL.I

Medicinal Herbs

with their formulations

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This book on *Medicinal Herbs* has been compiled and written mainly for medical, pharmaceutical and research scientists who are today or may in future to be concerned with the identity, efficasy and safety of Indian Medicinal Plants as well as of other countries. This book describes and illustrates more than 500 species of the most important medicinal plants and provides information on their habitats and growing conditions. The author have tried to give as much as possible informations including the latest scientific findings. The toxicities of some medicinal plants and the need for their careful handling are emphasized throughout the book. All readers will find something of value and also this book may enkindle serious interest in therapeutic use and clinical research on medicinal plants. This book is not a uniform or systematic encyclopedia of medicinal plants but what has been attempted here is to provide a focus on medicinal plants limiting the number of indications and formulations in a pragmatic manner to enlist a global interest in India's rich flora with a therapeutic potential of unprecedented magnitude.

In this book, by using the avenues of documented ayurvedic experience and informed dialogue on modern data as well as traditional literature, author want to emphasise that this work has historical and contemporary validity that will advance as the therapeutic use of the single plant and their formulation grows worldwide. Human history has shown that multiple options do exist for safeguarding health. To avoid any mistakes in identification any differences between the plants and other similar species have been highlighted.

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विषय संख्या _____ आगत नं० _____
लेखक Singh, H.P
शीर्षक Medicinal, Herbs with their formulations

दिनांक	सदस्य संख्या	दिनांक	सदस्य संख्या

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MEDICINAL HERBS WITH THEIR FORMULATIONS

– Volume 1 –

by

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PREFACE

Natural medicines, and especially plant based remedies, have for a long time been the main, and often the only, drugs used by doctors, and they also constituted the basis in the production of pharmaceutical medicines.

At the beginning of the 20th century, as the science of pharmaceutical chemistry blossomed–particularly with the complex synthesis of organic compounds—the production of chemotherapeutics became predominant in the pharmaceutical industry. Medical science was thus able to deal with a number of previously incurable and/or life threatening disease, especially infectious ones, using sulphonamide drugs, new antibiotics, and other chemical preparations. A significant role in eradicating a large number of infections was also played by immunotherapy.

This book on *Medicinal Herbs* has been compiled and written mainly for medical, pharmaceutical and research scientists who are today or may in future to be concerned with the identity, efficasy and safety of Indian Medicinal Plants as well as of other countries. This book describes and illustrates more than 500 species of the most important medicinal plants and provides information on their habitats and growing conditions. The author have tried to give as much as informations as possible including the latest scientific findings. The toxicities of some medicinal plants and the need for their careful handling are emphasized throughout the book. It is our hope that all readers will find something of value and also this book may enkindle serious interest in therapeutic use and clinical research on medicinal plants. We want to stress that this book is not a uniform or systematic encyclopedia of medicinal plants. What has been attempted here by us is to provide a focus on medicinal plants limiting the number of indications and formulations in a pragmatic manner to enlist a global interest in India's rich flora with a therapeutic potential of unprecedented magnitude.

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In this book, by using the avenues of documented ayurvedic experience and informed dialogue on modern data as well as traditional literature, we want to emphasise that this work has historical and contemporary validity that will advance as the therapeutic use of the single plant and their formulation grows worldwide. Human history has shown that multiple options do exist for safeguarding health. To avoid any mistakes in identification any differences between the plants and other similar species have been highlighted.It is our pleasure to acknowledge the help which we received from very many publications for completing the book. Much of the information was gleaned from the libraries of Botanical Survey of India. However, Forest Research Institute, Dehradun, Indian Agricultural Research Institute, Delhi, Central Library, Patna University, Patna and Birsa Agricultural University, Ranchi (Jharkhand State).

We are indebted to Dr. B.S. Singh, Mr. Ifthekar Alam, Miss Rashmi Renuka Toppo, Miss Leena Ekka, Mr. Subhas Chandra Mahto for their sincere and wilting help in correcting the typed manuscripts.

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M.P. Singh
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Chapter 1

INTRODUCTION

Natural medicines, and especially plant based remedies, have for a long time been the main, and often the only, drugs used by doctors, and they also constituted the basis in the production of pharmaceutical medicines.

At the beginning of the 20th century, as the science of pharmaceutical chemistry blossomed–particularly with the complex synthesis of organic compounds—the production of chemotherapeutics became predominant in the pharmaceutical industry. Medical science was thus able to deal with a number of previously incurable and/or life threatening disease, especially infectious ones, using sulphonamide drugs, new antibiotics, and other chemical preparations. A significant role in eradicating a large number of infections was also played by immunotherapy.

Nevertheless, medicinal herbs; and drugs from them, have not been totally abandoned. Plant based raw materials always served as the sources for active substances where ever the synthetic product was not known or where its cost was prohibitive as, for instance, in the case of ergot alkaloids, or opium alkaloids, foxglove glycosides and other substances.

Popular medicine and herbalism did not abandon or doubt the healing properties of medicinal plants, or the traditional treatments known from the beginnings of human development. In the course of the thousands of years of development, the range of uses and the varieties of medicinal plants increased considerably as new drugs and spices from other parts of the world were discovered as new effects in the palliative treatment by chemopharmacology and antibiotics came to light, with the discovery of the dietectic significance of some drugs, as new plant substances such as vitamins and hormones were distinguished, and as the anti-microbial, anti-viral, and anti-cancerous effects of newly recognized and well established plants from around the world were realized.

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Today physicians, research teams, and the pharmaceutical, industries of many countries have once again turned their attention to the sources of natural raw materials and to medicinal plants. Large research and production laboratories are being established, and medicinal plants as sources for the isolation and production of irreplaceable drugs are becoming important and highly profitable for industry and agriculture.

The interest in medicinal plants and their therapeutic effects has never ceased. Patients continue search for more knowledge about medicinal plants, their constituents, and their use in the treatment of various diseases. At present, the pharmaceutical industry produces a number of products the bases of which are from plants, such as therapeutic tea mixture, tinctures, injections, ointments, and so on. Plant medicines, however, are not suitable for the treatment of all disease. The proper therapeutical procedure and programme of treatment have to be determined by the physician, and the composition of the plant based medication (prescription) and the entire treatment must be under his or her supervision.

Nevertheless, herb-based medicines do have advantages over chemical compounds. Active constituents in plants are always biologically balanced, affect the human organism in a complex manner, do not usually accumulate in the body, and are even capable of neutralizing the harmful effects of other, usually chemical compounds. Naturally there are exceptions such as the powerful toxins contained in poisonous plants which must always be regulated according to a physicians prescription and dosage.

For these reasons medicinal plants and their active ingredients are once again claiming the attention of physicians, pharmacists and researchers as well as patients themselves. They contribute greatly by bringing health to the sick from the largest pharmacy in the world-nature itself. There is a worldwide revival of interest in natural products as preventive and therapeutic agents. India has had a very rich and ancient heritage of traditional systems of medicine–Ayurveda, Siddha and Unani. All these systems, officially recognised by the Government of India. The practical needs of many millions of Indians are currently served by these systems–particularly Ayurveda. Ayurveda is one of the indigenous systems of Medicines prevalent in India since 2000 B.C. Even today whether in towns or in villages a significantly large population in India uses the Ayurvedic system of medicine. Although efficacy of Ayurveda for a variety of human ailments is well known in and around India, most of the world is not aware of the benefits that could be derived from this unique Indian system of medicine.

A Look into the Past

There is very little documentary evidence from prehistory on the collection or cultivation of medicinal plants for therapeutical purposes. The early existence of some of the medicinal plants that are listed in this book was proven by the analysis of plant remains found in the proximity of medieval structures. In Switzerland, for instance, were found and identified the remains of seeds of the field cornflower; elsewhere the seeds of linseed and poppy were also discovered. On the American continent, the seeds of watermelons, beans and maize, including plant remains were examined. The ages of the plant materials were determined by radioisotopes dating and shown to be from 10,000 to 2300 B.C. Of course, it has not been proven that these species were also used as medicinal plants as well as for foods.

We can certainly assume, however, that the healing properties of some plants were discovered by primeval humans fairly early and that they learned to use them. By collecting and using medicinal plants, people gained valuable experience–good as well as bad–and handed down their knowledge to future generations. Much later, when writing was known, the experience and knowledge thus

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acquired were recorded and some of these have been preserved until now. One of the first written records concerning curative drugs and narcotic substances was found on a clay tablet in Assyrian cuneiform script dating back to 2700 B.C. The tablet mentions a 'brown drug, daughter of poppy', meaning opium. The Chinese herbarium dates from approximately the same era (2700 BC), and contains data on plants as medicines.

In ancient Egypt, medical science and the use of medicinal substances have an age old traditions. The treatment of people, particularly the upper classes, was carried out by priests in temples, intended especially for this purpose. During the third Dynasty of the Old Kingdom, the physician Anhotep (2635-2643 BC) was very famous. The Egyptian pharmacopoeia always had a supply of medications of plant and animals, as well as minerals, origins. There were twenty five types of medicinal plants, of which castor oil, sea onion and opium were considered panaceas for everything. As basic nutritional and medicinal plants, kitchen onion, garlic, lettuce, lentils, olives and caraway were used.

In ancient Babylonia sixty four species of medicinal plants were known in the years 772-710 BC. These included hellebore, henbane, hemp, funnel, saffron, thyme, mustard, chicory, dill, coriander, mullein and others.

The knowledge of Indian physicians is documented by the so called Bower manuscript found in 1889 in the ruins of Mingsi in central Asia. The document and its author praise the garlic as a panacea, claiming it to prolong life to 100 years. The documents describes another 500 species of medicinal plants, classified according to their effects into fifty groups. The manuscripts mentions the physicians Charak, Shusrut from 1000 to 800 BC.

In ancient China pharmacology and herbal medicines were the most extensive fields of medicines. They contained 8,160 prescriptions for the use of various drugs, with instructions on how to collect and prepare the medicinal plants. For medicinal purposes, they used sweet flag, comfrey, burdock, wormwood, daisies, caraway, gentians, liquorice, walnut, ribwort, castor oil, and opium. The use of ginseng as a panacea and re-juvenating remedy was also recommended.

The Arabs soon became involved in the trades in medicines and spices. They had bases in India and Sri Lanka. An authority among Arab physicians was a certain Decharbir, who described drugs formulated from mandrake, belladona, coffee and other plants. Of equal, it not greater fame in his day was Avicenna (AD 979-1037), a native of Bukhara. He wrote the *Canon Medicines*, in which he summarized in five volumes all the knowledge of his discipline.

From ancient Greece, the learned Hippocrates (460-370 BC) is acknowledged as the father of medicine. He was head of a school of medicine–Asclepiadae–and in his teachings and work, gradually freed medical science from superstitions. He summarized their knowledge of the therapeutic uses of medicinal plants and their method of cultivation.

From Greece, knowledge of natural medicine spread to ancient Rome. The first of the better known physicians of Greek origin working in Rome was Asclepiades (120-30 BC) and his succesors, Aulus Cornelius Celsus (AD 60). In their works, they described a number of healing plants and their effects. They mention gentian, poppy, hellebore, saffron, mustard and other species. Twelve books of Columella's work (AD 50) have been preserved, and they give instructions for the cultivation of field plants as well as some specific health plants, such as hemp, saffron, rhubarb with instructions on how to prepare drugs from these.

A great promoter of the cultivation and use of medicinal plants in healing was Charles I the Great. In his treatise, he encouraged monks in his empire to devote themselves to natural medicines and to

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the cultivation of medicinal plants. On the plan of the Benedictine monastery, the layout of the monastery garden is illustrated and shows sixteen beds for the cultivation of medicinal plants like sage, yellow wormwood, roses, lilies, irises, mint, aspen, fennel, tansy, rosemary, savory, cumin, senna and others. Many monks left this monastry and crossing the Alps, went to Germany and other countries, introducing to them many types of Mediterranean medicinal plants. In time, these species adapted to their new environment, became naturalized, and began to grow wild; they included balm, thyme, borage, sage, wormwood, lavender and others.

In Salerno, Italy, the tenth century saw the establishment of a famous school of medicine, the organisation of which was sanctioned and allowed various rights in 1150. This school was based on the classical authors of antiquity as well as on Arab medicines science. It became the model for later universities.

From the monastery gardens, the medicinal plants began to spread into the vicinity, first into the estates of the gentry and later into farm gardens. New knowledge accrued slowly and the old was forgotten. The thinking of scholars of that time was dominated by scholasticism, fruitlessly learned disputations and philosophising that avoided direct observations and impeded progress in natural sciences and the direct observation of nature. The spread of knowledge of medicinal plants was given impetus by the invention of printing and the import of new healing drugs into Europe from other parts of the world, following the discovery of America by Christopher Columbus in 1492.

A significant figure of renaissance medicine and pharmacology was the physician, alchemist and philosopher Theophastus. He became famous not only as a great expert on the effects of medicinal plants, but he also treated patients with chemical elements known at that time (sulphur, mercury, arsenic and others). He did not accept superstitions, myths, magic or the use of strange concoctions but preferred natural therapy using local medicinal plants and mineral waters. In the years 1800 to 1850 significant medicinal effects of substances of plant origin, such as quinine, emitine, caffeine, morphine, meconic acid, atropine, hyoscyamine, colchicine, coniine, aconite and others were discovered and isolated.

At the moment, scientific research into medicinal plants is continuing most intensely than ever in many research institutes, universities and pharmaceutical laboratories as well as in the clinics of many developed countries. This research is oriented mainly in two directions. Firstly, the active ingredients of the plants, that have long been known for their healing properties are being investigated. The second sphere of basic research has led to the discovery of new kinds of medicinal plants and new drugs from the more remote regions of the world, in the jungles and primeval forests where new species with unknown substances still remains to be looked into. These plant species are sometimes referred to as green medicines.

This book on *Medicinal Herbs* has been compiled and written mainly for medical, pharmaceutical and research scientists who are today or may in future to be concerned with the identity, efficasy and safety of Indian Medicinal Plants as well as of other countries. This book describes and illustrates more than 500 species of the most important medicinal plants and provides information on their habitats and growing conditions. The author have tried to give as much as informations as possible including the latest scientific findings. The toxicities of some medicinal plants and the need for their careful handling are emphasized throughout the book. It is our hope that all readers will find something of value and also this book may enkindle serious interest in therapeutic use and clinical research on medicinal plants. We want to stress that this book is not a uniform or systematic encyclopedia of medicinal plants. What has been attempted here by us is to provide a focus on medicinal plants

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limiting the number of indications and formulations in a pragmatic manner to enlist a global interest in India's rich flora with a therapeutic potential of unprecedented magnitude.

In this book, by using the avenues of documented ayurvedic experience and informed dialogue on modern data as well as traditional literature, we want to emphasise that this work has historical and contemporary validity that will advance as the therapeutic use of the single plant and their formulation grows worldwide. Human history has shown that multiple options do exist for safeguarding health. To avoid any mistakes in identification any differences between the plants and other similar species have been highlighted.

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Chapter 2

NURSERY TECHNOLOGY

Nurseries are going to play a very important part in afforestation and reforestation programme in India. A few decades back, plantations used to be raised mainly in the reserved forest area which are generally moist and hospitable, and direct seed sowing technique in the plantation site could be successfully practiced. The method consumed excess seeds, but since the total planting program was small, the absolute seed requirement did not amount to much. The chance of damage to the small germinating seedlings by grazing existed, but it was much less than it is today, since protection by intense policing was practicable. The present program of plantations in the country also includes planting in private farm lands, in community grazing lands and in government wastelands. Environmental factors at these sites are often harsh, with one or more adverse conditions present, such as erratic rainfall, infertile soils, high alkalinity and salinity, water logging, excessive biotic pressure and so on. At such sites, plantations by direct seed sowing are likely to be unsuccessful. Nursery raised seedlings of appropriate quality to raise plantations are of primary importance.

In order to raise healthy seedling in the nursery, the important factor to be considered are site selection, preparation of beds and potting mixture, pricking out of seedling, nursery establishment, manuring and fertilizer, watering, plant protection, grading and storing. Genetic quantities of the mother plant is very important in seed collection as trail like better yield, resistance to pests and diseases, hardy nature to adverse environmental conditions like drought and flood are passed from one generation to the other. The quality of the seeds depends on number of plants required for actual planting, germination percentage of seeds, viability of seedlings and post planting mortality. Screening and selection of superior seedling in the nursery itself is very important.

For the development of ideal nursery for the propagation of germplasm of medicinal plants, few nursery management tips are given below:

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2.1 Nursery Management Tips

2.1.1. Site Selection

- ☆ The site of the nursery should be as near the planting site as possible. The nursery should lie within a radius of 5 km from planting sites in the plains and 2 km in rugged hilly terrain.
- ☆ The area of the nursery should be about 0.4 ha (1 acre) for every 100,000 seedlings.

2.1.2. Potting Mixture (Nursery-Soil)

- ☆ There is a tendency to collect the topsoil area to fill the polythene bags. The practice is not good as it contributes to soil erosion.
- ☆ The whole success of nursery depends on good soil mixture. It should be light in weight, well decomposed and well drained and free from insects as well as weed seeds.
- ☆ Always use compost in the nursery. It can easily be prepared by decomposing organic materials (green leaves). It increases the nutrients contents of the potting mixture and enhances the air spaces and water holding capacity of the mixture.

2.1.3. Seed Collection and Sowing

- ☆ Always collect seeds from plus mother plants or phenotypically superior plants.
- ☆ A chart should be prepared in each nursery indicating the seeds collection period of medicinal plants along with the location of the herbs.
- ☆ Seedling developed from poor or abnormal medicinal plants will never produce good plants.
- ☆ After collection seeds should be processed carefully otherwise they may get damaged and loose viability.
- ☆ Each medicinal plants required different processing after seed collection *i.e.*, seeds with pulp (kadam) are to be processed in a different way than the pods (Mandhani), drupes (bansum and dhuna) and capsules (opium).
- ☆ In tropical herbs, the most of the seeds have short viability; therefore, sowing is to be done immediately after collection and processing the seeds *eg.* (Nagkesar).
- ☆ For the pretreatment of seeds, if needed (seed coat hard), it is always advisable to put the seeds in water for 24 hours and dry them in the shade before sowing.
- ☆ Sow large seeds (Amla) 2 cm to 3 cm deep in the soil.
- ☆ Sow small seeds (Kalmegh) about 0.5 to 1 cm deep or broadcast and cover them with a small amount of fine soil. The beds can also covered with thatch or plastic sheets till the germination of seeds.
- ☆ Before storing, the seeds should be mixed with prophylactics like gamaxene or neem leaves.

2.1.4. Watering

- ☆ Keep seeds beds moist not wet.
- ☆ Do not water at a fixed time each day. Water when the plants need it.
- ☆ Small seedling require less amount of water.
- ☆ Large seedling require more water more often.
- ☆ Seedling require more water more often on windly days and sunny days.

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- ☆ Water less often when seedling are kept in shade.
- ☆ The moss and algae growth is an indication of excess watering.
- ☆ Always use clean water; dirty water may cause diseases problem.
- ☆ Over-watering results into weak plants and cause diseases such as root-rot and damping-off of seedling.

2.1.5 Transplanting

- ☆ Water mother beds thoroughly before transplanting the seedling.
- ☆ Always use some tools (bamboo-sticks, etc.) to loosen the soil before pulling out seedling from the beds.
- ☆ Make a deep and wide hole in the polythene bag or container for transplanting the seedling.
- ☆ Hold seedling at the base of the stem and pull it out gently from the mother beds.
- ☆ Never bend the roots and do not force the seedling to fit into the hole.
- ☆ Keep transplanted seedling under proper shade until they have recovered.

2.1.6. Nursery Hygiene and Disease Control

- ☆ Most of the micro-organism, insects and pests that cause disease in the nursery live in weeds, trash and puddles. Therefore, keeping nursery in neat and clean condition to reduce the chances of attack of common diseases. All trash, waste polythene bags and diseased plants should immediately be removed and burnt at a place far from the nursery.
- ☆ *Pesticides Recommended*: Diazinon, Melathion, Sevin.
- ☆ *Fungicides Recommended*: Bavisteen, Benlate, Captan, Dithane M-45.
- ☆ *Dangerous Pesticides*: Aldicarb, Aldrin, DDT, Lindane, Nuvacron, Heptachlor etc. These are very dangerous. Never use them.
- ☆ *Natural Insecticides*: Neem seeds,
- ☆ Proper doses should be prepared by carefully reading the label or guidelines.
- ☆ Always provide protective clothing, mask, gloves and goggle to the person spraying the pesticides.
- ☆ Never mix insecticides and fungicides together in the same sprayer.
- ☆ Never eat, drink or smoke while spraying.
- ☆ Extra pesticides should be disposed by digging a hole away from rivers and wells.

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Chapter 3

BIOFERTILIZERS AND BIOLOGICAL PEST CONTROL

In recent times, the cropping pattern has undergone perceptible changes. During post-green revolution period, 1967-68 to 1992-93, growth rate in agricultural production was assessed at 2.84 per cent per annum. Production of food grains during this period increased from 950.5 lakh tonnes to 1795 lakh tonnes. Per capita net amiability of food grains increases to 468.5 g per day from 395 g per day in early fifties. Modern agriculture rely heavily on a wide range of synthetic chemicals which include different types of fertilizers and pesticides. Use of these chemicals has played a very vital role in increased agricultural production. During 1986-87, fertilizer consumption was 8.64 million tonnes, and it has increased to 13.83 million tonnes during 1994-95. Use of chemical fertilizers is a costly input and their manufacture depends on the dwindling resources of energy such as petroleum and coal. Productivity of the soil is undergoing strains as per unit crop yields are stagnating and higher doses of fertilizers are not giving commensurate increase in yields. Chemical fertilizers being industrial products are subjected to cost increases every year, and becoming unaffordable to a large segment of farmers. In order to withstand these constraints, a scheme "Balanced and Integrated Use of Fertilizers" is implemented to promote the use of chemical fertilizers in conjunction with enhanced use of organic compost, green manuring and biofertilizers. Similarly, due to widespread use of pesticides the food consumed by man today is contaminated with chemicals. Rain wash down pesticides into rivers causing pollution of water. In recent years, Integrated Pest Management (IPM) was given high priority to enable farmers to adopt measures which are environment friendly and less costly. Use of biocontrol

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agents, pesticides of plant origin, use of plant protection chemicals with residues not exceeding toxic limits and employing newer methods for rodent, birds, nematodes and mite control are being promoted.

Under a given situation, the system of the farming, soil management and manuring practices, etc. influence the productivity of soils and crop yields obtained from them. It is estimated that the different agricultural crops in India remove about 4.27 million tonnes of nitrogen, 2.13 million tonnes if phosphorus, 7.42 million tonnes of potash and 4.88 million tonnes of lime per year. Obtaining larger yields through improved varieties of crops and intensive cultivation increases the depletion of nutrients still further. Moreover, erosion and leaching cause additional losses. It is thus obvious that the huge depletion of nutrients impoverish the soil unless these supplies are replenish by natural or artificial means. The principle methods of supplementing natural recuperation and for improving the productive capacity of the soil are:

- ☆ To add organic matter (manures) to the soil so that through decay it may furnish a more or less continuous supply of nutrients to crops, and
- ☆ To restore or increase the amount of deficient nutrients by the application of fertilizers.

3.1. Manures

Manures are the organic substance obtains by the decomposition of animal wastes and plant residues, which supplies essential element, and humus of the soil. They are added mainly to improve the physical condition of the soil, to replenish and keep us the humus status to maintain the optimum condition for the activities of soil micro-organism and make good a small part of the plant nutrients removed by crops of otherwise lost through leaching and soil erosion. Thus they supply practically all the element of fertility which crops require, though not in adequate proportions.

3.1.1. Farmyard Manure

Good-quality farmyard manure is perhaps the most valuable organic matter applied to a soil. It is the most commonly used organic manure in India. It consists of a decomposed mixture of cattle dung, the bedding used in the stable and any remnants of straw and plant stalks fed to cattle. Partially rotten farmyard manure should generally be applied to the soil about 3 to 4 weeks before the sowing of a crop. However, if the manure is already well rotted, it is advisable to apply it just before sowing to a crop. Farmyard manure can be applied to all crops including medicinal plants grown in the rainy season or grown under irrigation. However, the use of farmyard manure alone causes an imbalance in nutrition owing to its relatively low content of phosphates. Therefore, to keep the soil well supplied with all the essential elements of plants food in a readily available form. It is one of the most important agricultural by-products. Unfortunately more than 50 per cent of the cattle dung produced in India is burnt as fuel and is thus lost to agriculture.

It must be stressed that the value of farmyard manure in soil improvement is due to its content of macronutrients and its ability to *(i)* improve the soil tilth and aeration, *(ii)* increase the water-holding capacity of the soil, and *(iii)* stimulate the activity of micro-organisms that make the plant-food elements in the soil readily available to crops. The supply of organic matter, which is later converted into humus is a property of farmyard manure. One tonne cattle dung can supply only 2.95 kg of nitrogen, 1.59 kg of phosphoric acid and 2.95 kg of potash.

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Table 1: Average Nutrient Content (in %) of Compost Manures

Manure Items	*Nitrogen (N)*	*Phosphoric Acid (P_2O_2)*	*Potash (K_2O)*
Cattle dung, fresh	0.3-0.4	0.1-0.2	0.1-0.3
Horse dung, fresh	0.4-0.5	0.3-0.4	0.3-0.4
Sheep dung, fresh	0.5-0.7	0.4-0.6	0.3-1.0
Poultry manure, fresh	1.0-1.8	1.4-1.8	0.8-0.9
Raw sewage, fresh	2.0-3.0	-	-
Sewage sludge, dry	2.0-3.5	1 .0-5.0	0.2-0.5
Cattle urine	0.9-1.2	tr.	0.5-1.0
Horse urine	1.2-1.5	tr.	1.3-1.5
Human urine	0.6-1.0	0.1-0.2	0.2-0.3
Sheep urine	1.5-1.7	tr.	1.8-2.0
Wood ashes Ash, coal	0.73	0.45	0.53
Ash, household	0.5-1.9	1.6-4.2	2.3-12.0
Ash, wood	0.1-0.2	0.8-5.9	1.5-36.0
Rural compost, dry	0.5-1.0	0.4-0.8	0.8-1.2
Urban compost, dry	0.7-2.0	0.9-3.0	1.0-2.0
Farmyard manure, dry	0.4-1.5	0.3-0.9	0.3-1.9
Filter-press cake	1.0-1.5	4.0-5.0	2.0-7.0

Table 2: Average Nutrient Content (in %) of Crop Residue, Straw and Stalks Manures

Manure Items	*Nitrogen (N)*	*Phosphoric Acid (P_2O_2)*	*Potash (K_2O)*
Rice hulls	0.3-0.5	0.2-0.5	0.3-0.5
Groundnut husks	1.6-1.8	0.3-0.5	1.1-1.7
Pearl millet	0.65	0.75	2.50
Banana, dry	0.61	0.12	1.00
Cotton	0.44	0.10	0.66
Sorghum	0.40	0.23	2.17
Maize	0.42	1 .57	1.65
Paddy	0.38	0.08	0.71
Tobacco	1.12	0.84	0.80
Pigeon pea	1.10	0.58	1.28
Wheat	0.53	0.10	1.10
Sugarcane trash	0.35	0.10	0.60
Neem cake	5.2	1.0	1.4
Mahuwa leaves	1.66	0.5	2.0
Castor cake	4.3	1.8	1.3
Tobacco dust	1.10	0.31	0.93

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Table 3: Average Nutrient Content (in %) of Dry Leaves Manures

Manure Items	*Nitrogen (N)*	*Phosphoric Acid (P_2O_2)*	*Potash (K_2O)*
Calotropis gigantean	0.35	0.12	0.36
Careya arborea	1.67	0.40	2.20
Cassia actriculata	0.98	0.12	0.67
Dhilenia pentagyna	1.34	0.50	3.20
Madhuca indica	1.66	0.50	2.00
Pengamia pinnata	3.69	2.41	2.42
Pterocarpus marsupium	1.97	0.40	2.90
Terminalia chebula	1 .46	0.35	1.35
Terminalia paniculata	1.70	0.40	1.60
Terminalia tomntosa	1.39	0.40	1.80
Xylia dolabriformis	1.37	0.30	1.61

3.1.2. Green Manure

Green manuring is the principle supplementary means of adding organic matter to the soil. It is done by growing of a quick growing medicinal plants and ploughing it under to incorporate it into the soil. The green-manure crop supplies organic matter as well as additional nitrogen, particularly if it is a legume crop, which has the ability to fix atmospheric nitrogen with the help of its root nodule bacteria. A leguminous crop producing 8 to 25 tonnes of green matter per hectare adds about 60 to 90 kg of nitrogen when ploughed under. This amount equals an application of 3 to 10 tonnes of farmyard manure on the basis of organic matter and its nitrogen contribution. The green manure crops also exercise a protective action against erosion and leaching.

Table 4: Average Nutrient Content (in %) of Fresh Green Manures

Manure Items	*Nitrogen (N)*	*Phosphoric Acid (P_2O_2)*	*Potash (K_2O)*
Cowpea (*Vigna catjang*)	0.71	0.15	0.58
Dhancha (*Sesbania aculeate*)	0.62	-	-
Cluster-bean (*Cyamopsis tetragonoloba*)	0.34	-	-
Horse-gram (*Dolichos biforus*)	0.33	-	-
Mothbean (*Vigna aconitilalla*)	0.80	-	-
Greengram (*Vigna radiata*)	0.72	0.18	0.53
Sunhemp (*Crotalaria juncea*)	0.75	0.12	0.51
Blackgram (*Vigna mungo*)	0.85	0.18	0.53

The increase in yield after green-manuring is usually to the order of 30 to 50 per cent. The fertilizing value of the legume crop can be increased a great deal by manuring it with super-phosphate. This practice not only increases the phosphorus content of the green manure plants, but also encourages their growth on the whole, thus converting an inorganic fertilizer into an organic fertilizer.

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3.2 Biofertilizers

The use of artificial riched soil cannot support microbial life and hence there is less humus and less nutrients and the soil thus becomes poor and eroded by wind and rain. Since, chemical fertilizers are made up of only a few minerals, they impede the uptake of other minerals and imbalance the whole minerals pattern of the plants body. To overcome these problems, the use of biofertilizers is being encouraged.

Biofertilizers are organisms which can bring about soil nutrients enrichment. They are biological active products or microbial inoculants of bacteria, algae and fungi separately, or in combination, which may help biological nitrogen fixation for the benefit of crop plants. They mostly include nitrogen fixing micro-organism. The following are some well known biofertilizers:

- ☆ Legume-Rhizobium symbiosis
- ☆ Azolla-anabaena symbiosis
- ☆ Loose association of nitrogen-fixing bacteria
- ☆ Diazotrophs (Azotobacter, Azospirillium)
- ☆ Cynobacteria, Mycorrhiza
- ☆ Phosphate solubilizing bacteria and fungi
- ☆ Frankia.

3.3. Biopesticides

The natural occurrence of diseases caused by micro-organism is common in both insect and weed populations and is a major natural mortality factor in many situations. For many practical reasons however, use of micro-organisms for pest control involve their culture in artificial media and later introduction of comparatively large amounts of inoculum into the field at an appropriate time and place. The technique is possible only with those micro-organisms that can be readily cultured in artificial media and moreover than can be induced to produce spores or other suitable resting stages which permit storage and application. Many fungi and bacteria can be handled in this way but insect viruses have the limitation that they have to be raised in living insects. This is unfortunate as insect viruses probably have greater potential for pest control than any other group of micro-organisms because of their virulence and selectivity.

As these biocontrol agents (microbial pathogens) are applied on the targeted pests in much the same way as chemical pesticides they are often termed as biopesticides or natural pesticides. Microbial phytotoxins, allelochemicals and other biocides of plant origin are also discussed here.

Bacillus thuringensis a bacterial pathogen infecting a wide range of insect pests is the most common microbial insecticide in use today. The disease agent is marketed by several companies and is registered for use against the insect caterpillar pests that attack a wide variety of vegetables, flower and ornamental crops. Unlike most chemical insecticides, it can be used on edible products upto the time of harvest. It is selective in action and does not harm parasites or predators of pests of any extent.

3.3.1. Natural Pesticides

Some useful weeds like Lantana, Notchi, Tulsi, Adathoda etc; act as natural repellent to many pests. The indigenous trees like pungam, wood apple, anona and their byproducts have excellent insecticidal value in controlling diamond black moth, heliothis, white flies, leafhopper and aphid

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infestation. The fish oil resin soap (FOS) is a safe, non-posionous natural product used for the control of developed white flies, mealybug, wooly aphid etc. A wider range of bio-extracts are proved to be more effective in controlling many insect Pests and Diseases.

Farmers in their traditional wisdom have identified and used a variety of plant products and extracts for pest control, especially in storage. As many as 2121 plant species are reported to possess pest management properties, 1005 species of plants exhibiting insecticidal properties, 384 with antifeedant properties, 297 with repellent properties, 27 with attractant properties and 31 with growth inhibiting properties have been identified. The most-commonly used botanicals are neem (*Azadirachta indica*), pongamia (*Pongamia glabra*) and manhua (*Madhuca indica).* Neem seed kernel extract (2 to 5%) has been found effective against several pests including rice cutworm, diamond backmoth, rice brown plant hopper, rice green leafhoppers, tobacco caterpillar, several species of aphids and mites. Mahua seed kernel extract (5%) is effective against sawfly (Athalia lugens proxima) and others.

The efficacy of vegetable oils in preventing infestation of stored product pests such as bruchids (*Callosorbuchus* spp.), rice and maize weevils (*Sitophitus* spp.) has been well documented. Root extracts of Tagetes or Asparagus work as a nematocide for plant parasitic nematodes. Similarly, leaf extracts of many higher plants can inhibit a number of fungal pathogens. A number of plants like *Chenopodium, Bougainvillea, etc.* have also been reported to be sources of antiviral principle. A number of herbal natural pesticides preparation which not only play a vital role to control the pathogen but also increase the growth as well as yield of crops, are given below:

1. Pongam (*Derris indica*)

Its extracts serve as natural pesticides. They can be used for controlling a variety of pests. Its extract is beneficial against the leaf eating caterpillars.

(a) Pongam Cake Extract

100 gm of Pongam cake is required for use in 1 litre of water. The Pongam cake is powdered well and tied in a muslin pouch and soaked overnight in water. The next morning the pouch is squeezed and the extract is taken out. The extract is then filtered and emulsifier is added at the rate of 1 ml for 1 litre of water. It is now ready for spraying. 10 kg of Pongam cake is required for preparation of 100 litres of spray, which can be used for one acre.

(b) Pongam-Neem Oil Extract

Pongam oil and Neem oil should be mixed in the ratio of 1:4. Mix 10 ml Pongam oil and 40 ml Neem oil with the emulsifier (1 ml/ 1 litre). It should be mixed well to enable the water to mix with the oil properly. To this add one litre of water. Shake it well and spray the mixture immediately.

(c) Pongam, Aloe and Neem Extract

1 kg of pounded Pongam cake, 1 kg of pounded Neem cake and 250 gms of pounded Poisonnut tree seeds are taken in a muslin pouch. This is soaked overnight in water. In the morning the pouch is squeezed and the extract is taken out. This is mixed with 1/2 litre of *Aloe* (*Aloe barbedensis*) leaf juice. To this 15 litres of water is added. This is again mixed with 2-3 litres of cow's urine. Before spraying 1 litre of this mixture is diluted with 10 litres of water. For an acre 60-100 litres of spray is used. This controls various pests effectively.

2. Tulsi (Ocimum spp)

Use of Tulsi for pest control has a long history. It has both repellent and herbicidal properties. Various extracts can be prepared from dried and powdered leaves, flowers and entire plants but their effectiveness appears to vary. Whole plants used as an effective insect repellent.

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(a) Tulsi Leaf Extract

100 gms of Tulsi leaves are needed to prepare 1 litre extract. The leaves should be soaked in water overnight. The next day the leaves are ground and the extract is filtered. To this 1 ml of khadi soap solution is added and stirred properly. This can be sprayed in the morning hours for effective control of pests.

3. Aloe (*Aloe barbedensis*)

Aloe has anti-fungal and anti-bacterial properties. It also has an attractant property when mixed with castor cake. Aloe in combination with other plant products also control a variety of pests efficiently. In this section we can see how various Aloe extracts can be prepared.

(a) Aloe-Nirgandi Extract

For preparation of 50 litres of this extract we require 2 litres of Aloe leaf juice. For extracting Aloe juice the outer part of the leaves are removed and the mucilaginous part is taken and ground. 5 kg of Nirgandi leaves (*Vitex negundo*) are taken and immersed in water. These leaves are boiled for half an hour and the extract is filtered. The Aloe juice and the Nirgandi extract are mixed together. This can be diluted in 50 litres of water and sprayed.

4. Melia (*Melia azadirachta*)

The leaves, bark and fruits are accredited with insect repellant properties. Leaves are placed inside books and folds of woollen garments to protect them from ancient times. The active principle is reported to be an alkaloid, soluble in hot water. A carotenoid, meliatin present in the aqueous extract of leaves acts as a repellant to grasshoppers. Few preparation of Melia extracts are given below;

(a) Leaf Extract

For 5 litres of water, 500 grams of green Melia leaf is required. Since the quantity of leaves required for preparation of this extract is quite high, (nearly 40 kilograms are required for 1 hectare) this can be used for nursery and kitchen gardens. The leaves are soaked overnight in water. The next day, the leaves are ground and the extract is filtered. The emulsifier helps the extract to stick well to the leaf surface.

(b) Cake Extract

50 gms of Melia cake is required for 1 litre of water. The Melia cake is put in a muslin pouch and soaked in water. It is soaked overnight before use in the morning. It is then filtered and emulsifier is added at the rate of I ml for 1 litre of water. It is now ready for spraying.

5. Custard apple (*Annona* spp)

The seeds of custard apple possess insecticidal and anti-feedant properties. The powdered seeds are used to destroy worms. Seeds are reported to be contact poison to flies, aphids and several beetles. The combined seed extract of neem and custard apple is toxic to housefly. It is also used as a nematicide. Different alkaloids namely annonine, muricine, artabotrine etc. are reported to be found in custard apple.

(a) Leaf Extract

Take 500 grams of custard apple leaves and boil it in 1-2 litres of water. Allow to boil till it becomes 1/4th of its original volume. Mix it with 10- 15 litres of water and spray over the crop. For an acre, 2-3 kg of leaves are required.

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(b) Mixed Extract (Custard Apple, Calotropis & Tobacco)

Take 500 grams of custard apple leaves and boil it in 1-2 litres of water. Allow to boil till it becomes thick. Filter the solution to get the decoction. Take 250 to 300 ml of calotropis extract. Take 500 grams of tobacco leaves and boil it in 1 to 2 litres of water for 45 minutes. Then filter the extract. Take 250 ml of biogas waste (whitish fluid which deposits in the biogas digester) and 100 grams of copper sulphate. Mix the above ingredients with 60 litres of water and spray it over the crop. The above quantity is recommended for an acre.

6. Nirgandi (*Vitex negundo*)

Its leaves possess insecticide properties. It is used in storage, godowns toward off insects. Extracts of the leaves and twigs show anti-bacterial activities. Nirgandi in combination with other plant extracts (*viz.* Aloe, Pongam, Castor, Calotropis) proves to be successful in controlling certain pests.

7. Sweet Flag (*Acorus calamus*)

The powdered rhizome is used as an insecticide for the destruction of fleas, bed bugs, moths, lice etc. It is effective in killing insect pests of stored grains and is considered to be better than chemicals which pose the problem of residual toxicity. The ether extract of the rhizome exhibits ovicidal and insecticidal properties with no residual toxicity. The alcoholic extract inhibits the growth of certain fungi.

Its rhizome powder and cow's urine are used for the pre-treatment of seeds before sowing in the fields and protect them against pathogens and pests. One litre of cow's urine and 50 gm of rhizome powder is required for treating 1 kg of seed.

8. Garlic (*Allium sativum*)

Garlic is a safe pesticide. It causes no adverse effects on man, animals and environment. The effectiveness of garlic as a pesticide is due to an acrid volatile oil. Various extracts of garlic can be used for pest control. The whole plant, bulbs, leaves and flowers may be used either fresh or dried. Preparation of different Garlic extracts are given in this section. The prepared/extracts should be used as soon as it is prepared due to the volatile nature of the oil. It remains effective for 4-13 days after application.

(a) Bulb Extract

Add 85 grams of chopped garlic to 50 ml of mineral oil (Kerosene). Allow this to stand for 24 hours. Then mix it with 450 ml of water to which 10 ml of soap solution has been added. Shake this mixture well and filter it through a fine cloth. Store this in a container. For application, dilute one part of the emulsion with nineteen parts of clear water. For example, 50 ml of emulsion is mixed with 950 ml of water. The best time to spray it is in the morning. Shake well before application.

(b) Garlic-Neem Spray

Take 1/2 a handful of neem seeds, 1 kg of garlic, 10 kg neem leaf (tender branches included) and 10.5 kg stem and root bark of Neem. Crush these and reduce it to pulp. To this, add 12 litres of water. Boil this in copper or clay vessel on slow fire till it is reduced to half. If neem seeds are not available, add 50 g of neem oil to the finished preparation or boil the mixture to increase viscosity of preparation. After boiling, allow the mixture to cool. Pass this preparation through a sieve and collect the filtered liquid. The material left over in sieve is fibrous. Grind this well and mix it with a light application of neem oil and a small quantity of turmeric boiled in water. Pack it in cellophane bags. This can be spread on ground before cultivation and on plants. This will prevent disease bearing insects and flies

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from resting on plants. It can be used in addition to the liquid spray, if necessary. Allow the boiled liquid preparation that has been filtered to settle for 4-5 weeks in a sealed jar. At the end of the period, filter it again so that it can be used in a sprayer. For maximum effect, use it at regular intervals of 3 days, and increase it from 3 to 7 days as plants grow. In wet weather, reduce the intervals and apply the undiluted preparation.

(c) Mixed Extracts in Cow's Urine

The extracts of Garlic, Chilli, Ginger, Neem oil, Tobacco, Asafoetida are dissolved in 72 hours old Cow's urine and dissolved. Before spraying, an emulsifier is added. For spraying on cotton 30-40 ml of this spray is used with 15ml of water and 70 ml per 15 ml water is used for spraying in pigeonpea.

(d) Garlic-Pepper Extract

Take two finely grated Garlic bulbs and two teaspoon pepper. Stir into four litres of hot water. Add a nut sized piece of soap and spray. This is very effective in controlling caterpillars on fruit trees and others.

9. Neem (*Azadirachta indica*)

Different parts of the neem tree can affect more than 200 insects species and some nematodes, fungi, bacteria and viruses. Neem contains several active chemicals, which work in different ways: as a result of this, pests are unlikely to become resistant to neem. The most well known chemical in neem is azadirachtin. Neem is easy to prepare and use, and is environmentally safe and not harmful to man and animals.

Neem protects itself from the multitude of pests with a multitude of pesticidal ingredients. Its main chemical broadside is a mixture of 3 or 4 related compounds, and it backs these up with 20 or so others that are minor but nonetheless active in one way or another. In the main, these compounds belong to a general class of natural products called triterpenses; more specifically, limonoids.

(a) Neem Extract

The 500 g Neem seed kernels are crushed and mixed with 10 litres of water. It is necessary to use a lot of water because the active ingredients do not dissolve easily. Stir the mixture well and leave to stand for at least 5 hours. Spray the neem water directly on vegetables using a sprayer or straw brush. The effect lasts for 3 to 6 days. If kept in the dark neem water will be effective for 3 to 6 days. It has been estimated that 20-30 kg neem seed (an average yield from 2 trees), can normally treat one hectare. If crops have to be watered, water should go directly on the soil because water running over the leaves of sprayed plants may wash off the extract. Its alcohol is available, 50 times more azadirachtin can be dissolved and extracted. This Neem spray is most effective against pests such as Cutworms. During the day the caterpillars stay on the ground and fed on plant roots. At night they eat young stems.

(b) Neem Oil

The kernels of the neem seed should be crushed and add a small amount of water until the mixture forms a firm paste that can be kneaded. Press firmly to extract the oil. The kneading and pressing should be continued in turn until the maximum amount of oil is removed. (The oil content of the seed kernel is about 45%).

In some areas there are traditional ways of removing oil from other seeds such as sesame or groundnut. It is a good idea to try these methods with neem. If the oil is heated in the process, its ability to control insects will not be affected.

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(c) Neem Cake

The neem cake, which is left after the oil is extracted from the seed, is also useful for controlling, several pests, which live in the soil, particularly nematodes.

3.4. Integrated Pest Management (IPM)

Use of biopesticides is likely to be an integral part of disease management strategy for crops (include medicinal plants) in the coming years. Looking to the future, biopesticides offer a potential solution to the dilemma from both the environment and industrial viewpoint in integrated disease management system.

There is practically no risk of developing pest resistance to such products. They are less expensive having no adverse effect on plant growth, seed viability, active constituents (percentage value) and yield of medicinal plants. To meet the demand of herbal products or crude drugs for growing pharmaceutical industries, increase in herbal production is of utmost importance and hence pesticides seem to be indispensable. The use of pesticides should be managed in such a way that it will not pose any serious threat to environment and human life.

Integrated pest management (IPM) is their selection, integration and implementation of pest control based on predicted economic, and ecological and sociological consequences. The Government of India has adopted IPM as a major thrust area and the main plan of crop protection programme. IPM approach is eco-friendly. It aims at minimal use of hazardous chemical pesticides and instead employing alternate pest control methods and technique like cultural, mechanical and biological and biopesticides.

Soil conditioning, crop rotation and improved sanitation practices are some simple methods to reduce pest problems. The crops can also be protected by eliminating pests by methods of starvations, where a target crop is grown to lure insects away from the economic crop. Sometimes, to obtain desirable pest control, biological methods are supplemented with chemical pesticides. Employing the natural enemies of crop pest like parasites and predators and a variety of bio-control agents, such as beneficial bacteria and viruses, have been successful in the management of pests. Among the cases of IPM success are the package for staple crops *viz.* sugarcane, cotton, citrus, vegetable etc.

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Chapter 4

ORGANIC FARMING: AN APPROACH FOR SUSTAINABLE HERBI-CULTURE

Organic Agriculture Systems are not a repudiation of the assets of modern agricultural technology, neither are they defined by the simple elimination of synthetic fertilizers or pesticides.

According to Lord Northbourne, it is biodynamic farming, had a vision of the farm as a sustainable, ecologically stable, self-contained unit, biologically complete and balanced-a dynamic living organic whole. The term thus did not refer solely to the use of living materials (organic manures, etc) in agriculture although obviously it included them, but with its emphasis on wholeness is encompassed best by the definition of pertaining to, or characterized by systematic connection or coordination of part of the one whole!

In reality, organic agriculture is a consistent systems approach based on the perception that tomorrow's ecology is more important than today's economy. Its aim is to stop degradation and reestablish natural balances. The economy must readjust to the primary production factors, and riot the other way around. Without ecology, there is no economy. If conventional agriculture had been made to pay for the degradation and environmental damage it is causing, the move towards organic farming system would have been made long ago. Besides this other possible aims of organic agriculture are:

- ☆ To work as much as possible within a closed system and draw upon local resources.
- ☆ To maintain the long term fertility of the soil

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- ☆ To avoid all forms of pollution caused by agricultural techniques
- ☆ To provide a foodstuff of high nutritional quality in sufficient quantity
- ☆ To reduce the use of fossil energy in agricultural practices to the minimum tending of zero
- ☆ To give to all livestock the conditions of life that conform to their physiological needs
- ☆ To make it possible for agricultural families to earn a living through their work and develop their potentialities as human beings
- ☆ To maintain the rural environment and also preserve non-agricultural ecological habitats

4.1. Concept of Organic Farming

Organic refers to the agricultural systems used to produce food and fiber. Organic farming systems do not use toxic chemical pesticides or fertilizers. Instead, they are based on the development of biological diversity and the maintenance and replenishment of soil fertility. Organic foods are minimally processed to maintain the integrity of the food without artificial ingredients, preservatives, or irradiation. Organic farming describes two major aspects of alternative agriculture:

- ☆ The substitution of manures and other organic matter for inorganic fertilizers.
- ☆ The use of biological pest control instead of chemical pest control.

Organic agriculture is one of several to sustainable agriculture and many of the techniques used (*e.g.*, inter-cropping, rotation of crops, double-digging, mulching, integration of crops and livestock) are practiced under various agricultural systems. What makes organic agriculture unique, as regulated under various laws and certification programmes, is that: (1) almost all synthetic inputs are prohibited. and (2) soil building crop rotations are mandated.

The basic rules of organic production are that natural inputs are approved and synthetic inputs are prohibited, but there are exceptions in both cases. Certain natural inputs determined by the various certification programmes to be harmful to human health or the environment are prohibited (*e.g.* menic). As well, certain synthetic inputs determined to be essential and consistent with organic farming Philosophy. are allowed (*e.g.* insect pheromones). List of specific approved synthetic inputs and prohibited natural inputs are maintained by all certification programmes and such a list is under negotiation in Codex. Many certification programmes require additional environmental protection measures in adoption to these two requirements. While many farmers in the developing do not use synthetic inputs, this alone is not sufficient to classify their operations as organic.

4.2. Needs of Organic Farming

Organic agriculture is the key to a sound development and a sustainable environment. It minimise environmental pollution and the use of non-renewable natural resources. It conserves soil fertility and soil erosion through implementation of appropriate conservation principles.

Several reasons have been emphasized for the need of organic agriculture, like limited land holdings, poor socio-economic conditions of farmers, rise in input cost etc. The broadest view shows two major reasons *viz.*, population and environment, emphasised the ultimate need for ecofriendly technologies. FAO estimates that by the year 2005 the global population will be 25% higher than in the mid 1980s and that 900/b of this population increase will be in the developing countries like India. It will be necessary to increase the supply of food and other agricultural products to meet their needs. At the moment, many of the methods being used to increase production are damaging to natural resources

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and the environment and farmers are supposed to invest heavily into inputs to improve yields and productivity. Further, the produce from organic farming has become inevitable. The food containing pesticides and other chemicals are increasingly made obvious by many research studies revealing the presence of pesticide residues in eatables. About one million people suffered from pesticides poisoning and 20,000 die every year due to the toxic effects of these chemicals worldwide but the crop loss due to pest is still 15.000 crores, apart from killing a portion of the human population by the same pesticide use. This perspective is also one of the needs for organic approach to farming. In order to avoid the deleterious effects of synthetic chemical fertilizers and pesticides, organic agriculture is needed as an alternative to provide ecologically safe methods of farming.

Organic agriculture is a production system, which avoids or largely excludes the use of inorganic fertilizers, pesticides, growth regulators and livestock feed-additives. To the maximum extent feasible, organic farming system rely on crop rotations, crop residues, animal manures, legumes, green manures, off farm organic wastes and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests.

Sustainable agriculture, by definition, is that form of farming which produces sufficient food to meet the needs of present generation without eroding ecological assets and productivity of life supporting system of the future generation. The key characterization of organic farming in relation to sustainable soil fertility and organic farming include:

- ☆ Protecting the long-term fertility of soil by maintaining organic matter levels, fostering soil biological activity and careful mechanical intervention.
- ☆ Providing crop nutrients indirectly by using relatively insoluble nutrient sources which are made available to the plants by the action of soil micro-organisms.
- ☆ Nitrogen self-sufficiency through use of legumes and biological nitrogen fixation as well as effective recycling of organic materials, including crop residues and livestock wastes.
- ☆ Weed, disease and pest control relying primarily on crop rotations, natural predators, diversity, organic maturing resistant varieties and limited thermal, biological and chemical intervention.
- ☆ The extensive management of livestock, paying full regard to their evolutionary adaptations, behavioral needs and animal welfare issues with respect to nutrition, housing health, breeding and rearing.
- ☆ Careful attention to the impact of farming system on the wider environment and the conservation of wild life and natural habitats.

Organic agriculture is viable alternative to conventional agriculture. It protects the soil from erosion, strengthens natural resources base and sustains biological production at levels commensurate with the carrying capacity of managed agro-ecosystem, because of reduced dependence of fertilizers and Plant Protection chemicals; problems of environmental pollution are greatly reduced if not totally avoided. The practice leads to regeneration of ecosystem. There is now a demand worldwide for organically grown foods, which command a premium in export markets. The demand for such safe foods is increasing annually and this opportunity needs to be exploited.

Organic agriculture is often associated with low yields. The demands for products of organic agriculture are growing in India. The European Union (EU) and the International Federation of Organic Agriculture Movement (IFOAM) have defined rules for organic agriculture producers. India too needs to establish its own certification scheme to facilitate exports of organic agriculture products and an

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accreditation agency to certify the produce of the farm. The essential elements of an organic quality assurance scheme are as follows:

- ☆ Development of standards
- ☆ Inspection and verification
- ☆ Certification
- ☆ Accreditation

As low yields are expected, the market's ability to pay a price premium is a key determinant of sustainable growth of organic agriculture. The European Union is currently world's leading market for organic products with various countries within the EU having deficits of fresh organic products. The legislation on organic agriculture varies across countries. At present certification is compulsory for the organic foods exported from India. To encourage mass production and consumption of organic products, there should be clear-cut policies and incentives to promote organic agriculture and necessary infrastructure and market.

National level efforts are needed to facilitate the successful adoption of organic agricultural by the farmers. The approach shall be farmer centered and programmes developed shall create conditions for the conservation and efficient use of locally available resources as inputs in agriculture. Research has also to play to the extent of developing appropriate agro-techniques in conformity with the basic principles of organic agriculture.

4.3. Economic and Market Status

Prices for organic foods reflect many of the same costs as conventional foods in terms of growing, harvesting, transportation and storage. Organically produced foods must meet strict regulations governing all these steps so the process is often more labor and management intensive and farming tends to be on a smaller scale. There is also mounting evidence that if all the indirect costs of conventional food production (cleanup of polluted water, replacement of eroded soils, costs of health care for farmers and their workers) were factored into the price of food, organic foods would cost the same, or, more likely be cheaper.

The organic agriculture is economically viable, that farmers can achieve more income as a result of premiums and that they need fewer inputs to maintain returns. Organic systems are based on the optima use of local resources and technologies and can give farmers greater independence and more control over their means of production. However, more comprehensive monitoring is needed to analyze their sustainability and impact.

Many farmers enter organic production because they want to farm in a more holistic way. Other major stimuli for developing organic agriculture include environmental and social concerns, economic necessity, a lack of chemical inputs, and market demands. Small farmers are also encouraged to take tip any stay in organic farming by the prospect of being able to produce more food at the subsistence level, having a larger surplus for local sale, or being able to cultivate a product of significant export value. Farmers are most responsive to organic agriculture when they have not been exposed to the 6 chemical message and their farming systems involve traditional or nil inputs. When production is relatively labour intensive and if farmers have the chance of developing the organic concept themselves they are also more inclined to convert to organic agriculture.

Farmers are less rely to take up organic farming in situations of high labour cost and labour scarcity and where there has been an over exposure to the chemical message. Farmers with relatively

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mechanized farms and a commitment to high input, high output strategies are also less likely to convert. Insecure land tenure means small farmers will be reluctant to plant permanent crops.

In developing countries, organic farming methods seems to provide similar outputs, with less external resources, supplying a similar income per labor day as high input conventional approaches. Large increase is observed where local farmers adopt organic farming systems, up to 400%, reaching levels "similar to those of high-input systems. Direct comparison of yields are difficult because of the differences in the farming systems adopted under high-input or organic management.

4.4. Organic Market

Consumer demand for "healthier" food has been considered one of the major factors influencing increased consumer demand for organic food. This perception is probably reflected in the lower consumption of livestock products among the consumers most likely to buy organic food. A survey of consumer choice in the United Kingdom showed that apart from health concerns, organic food was bought for environmental and animal welfare reasons. Approximately 70% of consumers buying organic food mentioned these two factors.

The trade in organic products is growing rapidly and becoming a reality throughout the world. Growth rates in the sector show organic products, that a few years ago supplied niche markets, have now entered mainstream marketing channels. Already 30,000 organic farmers are certified in Italy. In Scandinavian countries like Sweden and Finland and in Switzerland some 8% of farming is (certified) organic. Austria leads the world with 10% organic farming and in some Austrian provinces such as Salzburg and Tirol, the proportion is almost 50%. Although some in the organic movement might question whether we are straying from the path of 'healthy natural' growth, it cannot be denied that we are heading for a boom.

Approximately 1% of the U. S. food supply is grown using organic methods. In 1996, this represented over $3.5 billion in retail sales. Over the past six years sales of organic products have shown an annual increase of at least 20%. Organic foods can be found at natural foods stores, health food sections and produce departments of supermarkets and at farmers' markets, as well as through grower direct-marketing such as C. S. A. (Community Supported Agriculture). Many restaurant chefs across the country are using organic produce because they desire its superior quality and taste. Organic food is also gaining acceptance on a worldwide basis, with nations like Japan and Germany becoming important international organic food markets.

Though only a small percentage of farmers are expected to become organic producers, consumers demand for organically produced food and fibre products provides new market opportunities for farmers and businesses around the world. For many years, and with great success, the private sector alone has developed the concepts and markets for organic , products. However, the surge in consumer interest has created new interest from the public sector, and developing countries are particularly in need of good information.

The export opportunities offered by the so-called developed world have clearly been a major stimulus in getting organic farming established in many countries. It is unlikely that organic agriculture would have developed so successfully in the northern hemisphere if there had been no demand pressure. Supplying a market in which demand outstrips supply is a producer's dream. This has been the case with organic farming for a long time and figures show that this trend is set to continue. Yet, the sector has shown it is also vulnerable and that prices can collapse if there are sudden and exceptional increases in the supply of particular products. Therefore, Marketing with a clearly targeted strategy is

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a must for organic products. The organic market is a special one, partly because premium prices are involved. It requires a special effort. Attention should be given to meeting the requirements of a guarantee system that will ensure organic quality and allow consumers to develop their preferences for organic products with a feeling of trust.

4.5. Constraints and Opportunities

- ☆ In most cases farmers and post-harvest businesses seeking to sell their products in developed countries must hire an organic certification organization to annually inspect and confirm that these farms and businesses adhere to the organic standards established by various trading partners. The cost for this service can be expensive, although it varies in relation to farm size, volume of production, and the efficiency of the certification organization (*e.g.* IFOAM certification costs a maximum of 5 per cent of sales value). Few developing countries have certification organizations within their borders, and even when sufficient resources are available to pay for certification farmers often lack the information to find credible inspectors.
- ☆ While most developing countries have focused on export markets in the developed world, domestic market opportunities for organic food or eco-food may also be exploited. In China, for example, there is a growing market for "green food" which, according to government grading standards, is produced without certain pesticides and fertilizers and with biological methods. Chinese farmers also product organic food for export (*e.g.* tea to the Netherlands, soybeans to Japan).
- ☆ Whether the intent is to sell organic products domestically or abroad, reliable market information is difficult to obtain. There is virtually no systematic production or market survey data being collected with which to assess the role-and pattern of organic market growth. In particular, no projections for the market in the developing world have been made, nor have markets systematically been identified for developing country exports.
- ☆ There is a growing consumer demand in the developed countries for healthy food products. This change in the consumer preference reflects the increasing concern about the dangers associated with the consumption of food containing small quantities of food additives and pesticide residues. As the organically produced food is devoid of such harmful additives and residues, it is regarded as healthy food and, as such, enjoys special consumer preference. To the average consumer in the developed countries, organically produced food is more acceptable than the food produced under the conventional agricultural system because of the special qualities possessed by the former in regard to taste and nutrition.
- ☆ In the developing countries organically produced food has not yet gained consumer acceptance to any appreciable extent. This is despite the presence of harmful chemical residues at higher concentrations in vegetables, fruits and other farm produce. These pesticide residues lead to all kinds of chronic diseases of the heart, brain, kidney and liver including cancer.
- ☆ There is lack of awareness among the people of the developing countries about poisons in the food they are consuming daily. Even for those who are aware of the dangers of poison in fact, they do not have easy access to organic products. Wherever such products are available, they are costlier than the conventionally produced items mainly because organic agriculture does not enjoy the benefit of subsidy. However, there are still parts of India and other

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developing countries where people have access only to organic (chemical-free) foods because agro-chemicals have not yet penetrated into interiors and hinterlands.

- ☆ By introducing a wholly different segment of the consumer population to organic foods, supermarkets can help increase sales of organic products, improve the consistency of supply by creating greater demand and increase overall customer awareness of organic issues. These supermarkets can plough the vast masses of consumer, turning nonusers into light user, and light users into regular customers of organic specialty stores. A problem for specially stores and supermarkets is consumer resistance to the higher price of organic products. In spite of this, consumers who are aware are willing to pay higher price for such products not only because they taste better, but also because of the realization that, in the process, they are supporting organic farming and thus protecting the environment.

Very often organic farming systems begin with the production of 'cash crops' and gradually, with the knowledge gained in producing for export, the whole farming unit is converted to organic systems. Thus, planting herbs in plantations crops and using compost is often followed by introducing organic methods into the cultivation of medicinal herbs.

There has always been agricultural trade. Trade remains a necessity whether it is barter between neighbors or long-distance trade facilitated by money. Trade makes it possible for house-holds to supplement their own production and satisfy their need for food and money whilst exploiting comparative.

Farm inputs such as fertilizers and pesticides labels 'Organic' need to be verified. The farmer should have some way of knowing that the material purchased are acceptable brands to be used in sustainable farming practice. Guidelines need to be developed concerning acceptable and non-acceptable inputs.

4.6. Suggestions

- ☆ It is essential to set up and enlarge organic herbal raw material bases to satisfy people's growing demand for organic raw material that purpose, bases should be selected on the basis of the investigation and analysis of the environment quality background of the locations. Measures should be taken to ensure the production bases free environment pollution and in sound agricultural environment.
- ☆ It is important to develop organic crude drug processing industry by setting various types of organic processors producing various organic items, thus increasing the variety of organic products in the market as well as the economic benefit by processing.
- ☆ Actively opening up organic herbal market both at home and abroad stimulate development of the trade of organic herb. Market determination production. Only market can stimulate development of the production and processing of organic herb and production of quality of organic herb turn the development of the market.
- ☆ In developing the market for organic herb, the world market demand will usually stimulate development of a country organic herb. Therefore, demanded by the world market will help develop domestic market. But to build a sustainable organic herbal marketing system, it is essential to develop and world market simultaneously.
- ☆ To ensure the quality of organic, it is essential to formulate organic herbal production and processing standards inline with the basic standards of IFOAM, to set up certifying

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organizations and to strictly enforce the procedures for inspection, and certification organic herbs. Inspection and certification or organic herb supply system as well as the guarantee of the quality control of organic produce. Most of the countries have not yet worked out their own country's standards nor set up any certifying organizations, which has significantly affected the development of organic herbs more attention should be paid to this work.

4.7. Indian Needs

To place organic farming on a sound footing in India, urgent action is necessary on the following fronts:

- ☆ Knowledge development and training of farmers in grading, curing and post-harvest practices according to international standards to ensure quality outputs. Enhancement of labour efficiency by developing intermediate technologies. Value addition process at farm-level or community-level to improve the income of farmers.
- ☆ Arrangement for easy credit for working capital, supported by buyback arrangement, will encourage farmers to take up innovative cropping system.
- ☆ A separate Organic Development Wing under the Ministry of Agriculture could bring greater synergy to the effort to promote organic farming and the export of organic products.

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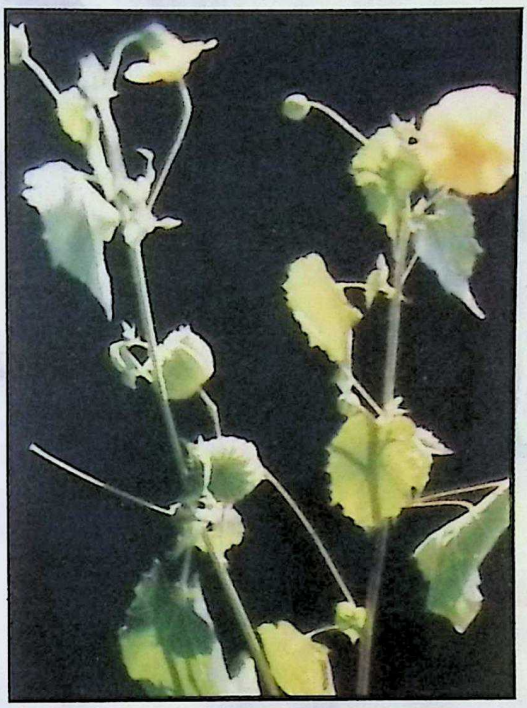
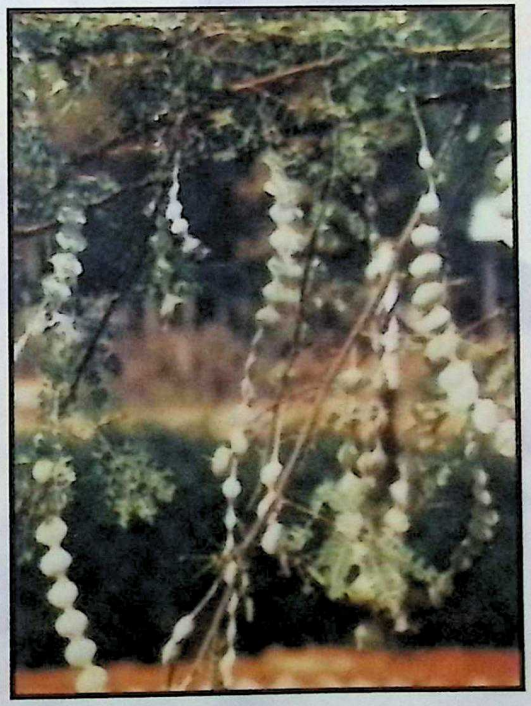
Abelmoschus moschatus



Abutilon indicum

Acacia catechu



Acacia nilotica

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Achyranthes aspera

Aconitum heterophyllum

Aconitum violaceum

Acorus calamus

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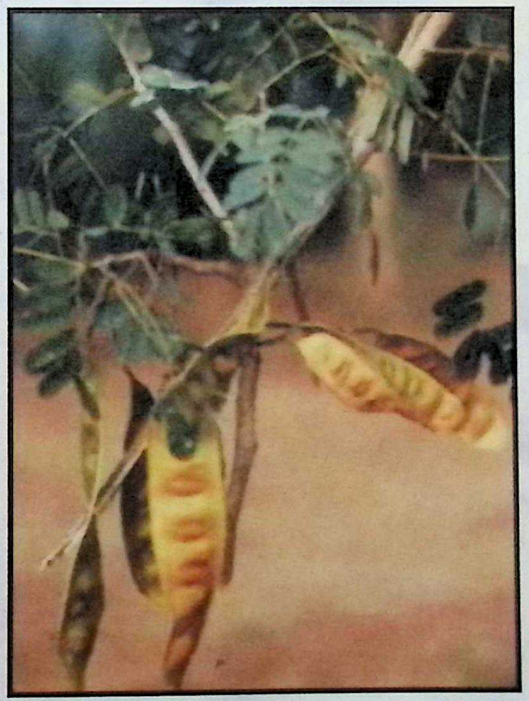
Aegle marmelos

Ailanthus excelsa

Ajuga bracteosa



Albizzia lebbeck

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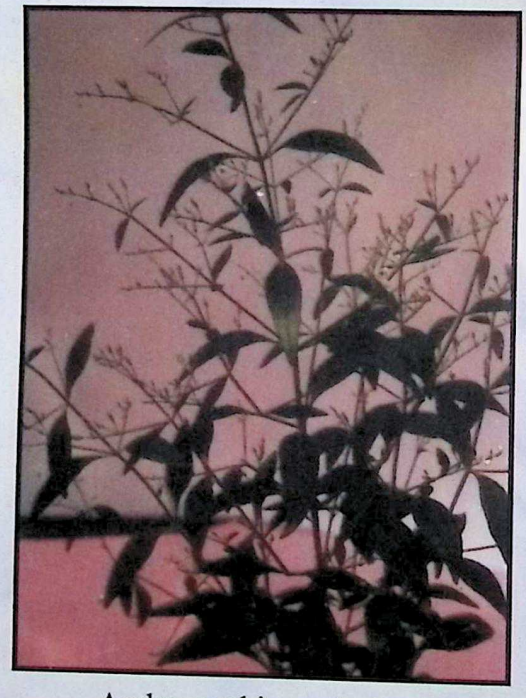
Allium cepa

Allium sativum

Aloe barbadensis



Andrographis paniculata

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Asparagus racemosus

Azadirachta indica

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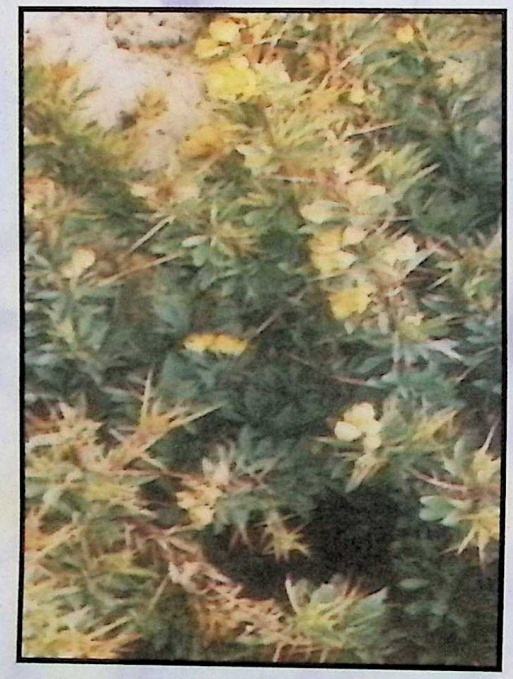
Bacopa monnieri

Bauhinea variegata



Berberis lycium

Bombax ceiba

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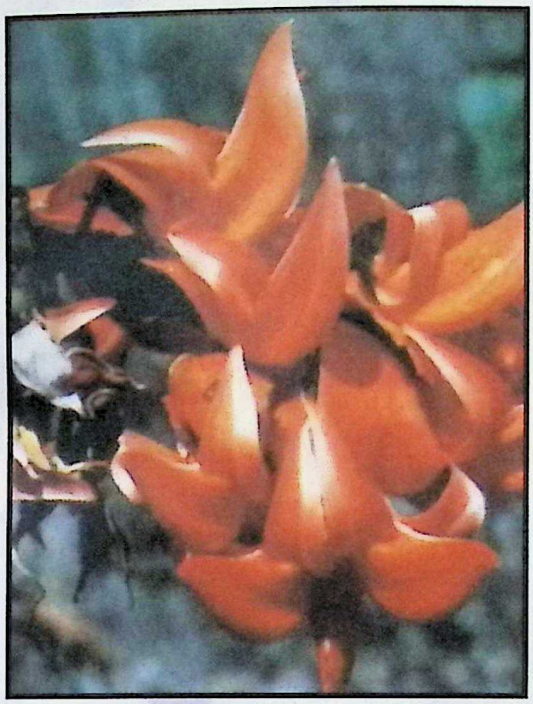
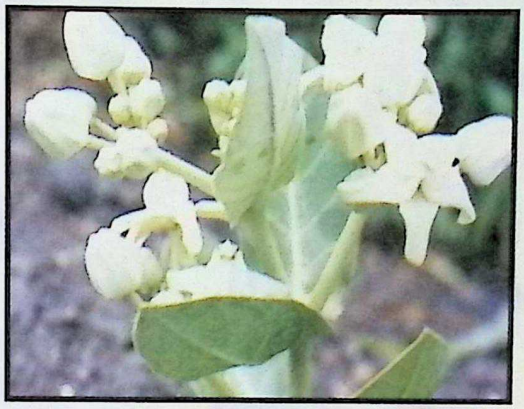


Butea monosperma



Calotropis gigantean

Cannabis sativa

Carthamus tinctorius

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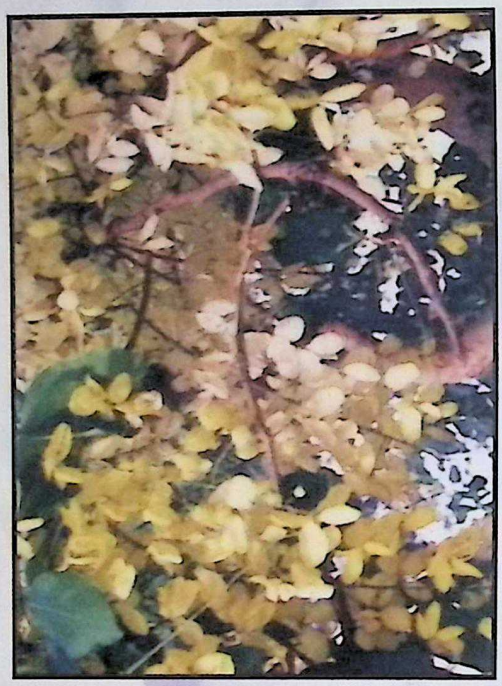

Cassia fistula

Catheranthus roseus

Centella asiatica

Chenopodium ambrosioides

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Chapter 5

MEDICINAL HERBS WITH THEIR FORMULATIONS

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Abrus precatorius, Linn. or *A. Minor* or *A. Paucifloros*

Vernacular Names

Sans., Bom. & Mah.–Gunja; *Eng.*–Jequirity, Indian or Jamaica or wild liquorice; *Pers.*–Gunchi, Chashami-Khurosa; *Hind.*–Rati, Gaungchi, Gunchi, Gunja; *Gwalior.*–Ghumachi; *Guj.*–Gumchi, Chanothi; *Ben.*–Kunch, Koonch; *Tel.*–Guruginia; *Tam.*–Gundumani, Kunthamani; *Can.*–Gurugunji; *Mal.*–Kunni, Gundumani; *Punj.*–Mulati. *Kash.*–Shangir; *Urdu & Arab.*–Ain-ed-dik (seeds) which are like cock's eye.

Habitat

All through the plains of India, from the Himalaya down to Southern India and Ceylon.

Abrus precatorius

Parts Used

Roots, Seeds and Leaves.

Constituents

Seeds contain poisonous proteins, a fat-splitting enzyme, a glucoside abrussic acid, haemagglutinin, a quantity of urease and an albuminous substance named *abrin* the active principle, which is of the nature of a toxalbumin similar in action to the *ricin* of castor oil seeds. Like all albuminous seeds it loses its activity when boiled. Roots obtain about 15 per cent glycyrrhizin and 8 per cent of an acid resin; leaves also contain about 10 per cent of glycyrrhizin and abrin. Shell of the seeds contains a red colouring matter. Abrin contains two fractions–a globulin and an albumose–the former being more powerful.

Two new steroids–abricin, mp. 85°, and abridin, mp. 67°–isolated from seeds and characterised; in addition, cycloartenol, β-amyrin, campesterol, cholesterol, stigmasterol, β-sitosterol and squalene also isolated; new flavonoid–abrectorin–isolated along with desmethoxycentaurein-din-7-O-rutinoside and its structure determined; trigonelline, choline, hypaphorine and abrine isolated; abrin A from seeds containing carbohydrate moieties consisting of neutral and amino sugars, has been suggested to be mixture of isolectins; new triterpenoids–abruslactone A, methyl abrusgenate and abrusgenic

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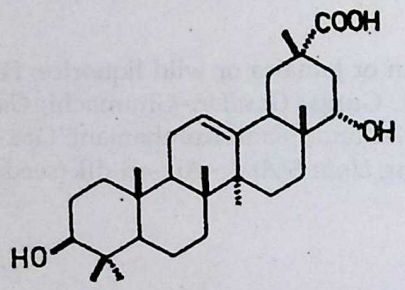
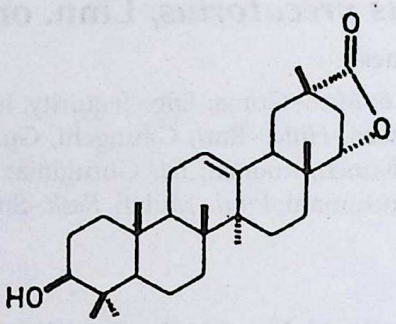
acid-isolated and structures elucidated by X-ray analysis; galactose, arabinose and xylose isolated from leaves, stems, roots and seeds; xyloglucosyldelphinidin and p-coumarylgalloyl-glucosyldelphinidin isolated from seed coat.

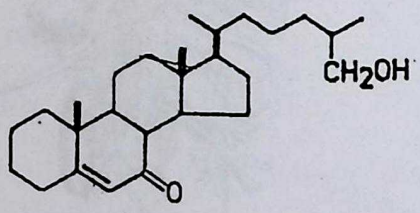
New Compounds



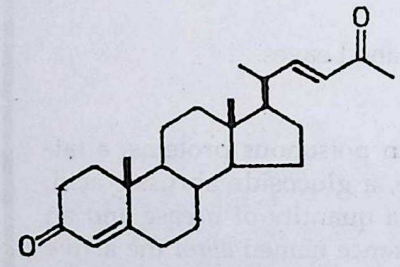
Abrusgenic acid



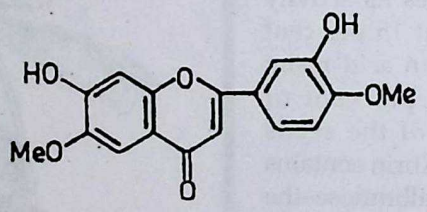
Abruslactone A



Abricin



Abridin



Abrectorin

Biological Activity

Biological properties of abrin A were similar to those of abrin C. It was toxic to cell-free protein synthesis.

Action

Seeds are purgative, emetic, tonic, antiphlogistic, aphrodisiac, anti-ophthalmic. *Abrin* is an intensely poisonous albumin. Doses of about 1/1000 mgm. to 1/2000 mgm of *Abrin* per kilogram body weight injected subcutaneously are poisonous. An infusion of the bruised seeds when applied to the conjunctiva may cause fatal poisoning due to absorption of the toxic abrin through the conjunctiva. *Abrin* is a very powerful irritant and produces oedema and ecchymosis at the site of inoculation. It has little or no irritant action on the mouth and throat and is digested and rendered harmless in the

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stomach. One interesting phenomenon about *Abrin* is that, when it is injected into animals in infinitesimal doses, the animal rapidly acquires immunity to the action of the poison. The action of the seeds resembles, that of the bacterial toxin. The temperature is lowered by the injection of their infusion into the circulation of the lower animals and death takes place from cardiac depression and the blood remains fluid after death. This poisonous property has been utilized by ophthalmologists for exciting an artificial purulent ophthalmia for the cure of pannus, granular lids or trachoma. Hakims state that the seeds are hot, dry, tonic and aphrodisiac.

Preparations

Infusion, Medicated Oil, Paste of seeds and Juice of fresh leaves. Infusion for *external* application. *Medicated oil* prepared by boiling together two parts of *Gunja* and 4 parts of juice of *Bhrangraj* in 4 parts of Gingelly oil; syrup from roots.

Uses

Leaves steeped in warm mustard oil are applied over the seat of pain or they are warmed over the fire and applied after smearing the part with warm castor oil. *Juice of fresh leaves* mixed with some bland oil is applied to painful swellings. Juice rubbed daily with plumbago root (*chitraka*) to leucodermatic spots for about a month will remove them to a large extent. *Leaves of the white seeded variety are sometimes chewed separately or with cubeb and sugar and their juice swallowed in cases of hoarseness and aphthous stomatitis. Root* is made into a syrup by boiling 2 ounces of fresh roots with 1 ounce of Abelmoschus capsules sliced, in 10 ounces of water for half an hour, straining, then adding 8 ounces of sugar or honey and boiling down to the consistence of a syrup. *Dose*: 1 to 4 drachms to be given frequently in the coughs of children. This syrup must be made fresh as required as its does not keep well. *Seeds* when powdered and boiled with milk have a powerful tonic and aphrodisiac action on the nervous system. Dose of the powder is 1 to 3 grains. If administered uncooked they act as strong purgative and emetic; in large doses they are acrid poison, giving rise to symptoms like those of cholera. Seeds are poisonous and are used by sweepers and other lower class people for criminally poisoning cattle to obtain their skins. Seeds are ground into a paste and made into needles which are inserted under the skin of the animal. Similar needles have also been used to produce criminal abortion. Seeds are rubbed with a little water into a *paste* and applied to contusions to reduce pain and swelling. It is also applied to the bare skin in alopecia, in sciatica, stiffness of the shoulder-joint, paralysis and other nervous diseases. Mixed with the paste made of plumbago root it is applied as a stimulant dressing in white leprosy. When decorticated and finely ground they are used for pannus cornea (vascularisation of the cornea, usually due to the irritation of the granulations in conjunctivitis, the cornea is normally non-vascular) and granular lids. They cause a true purulent ophthalmia. In olden days *Abrin* or a three per cent solution (or an infusion) prepared by steeping the decorticated and powdered seeds in cold water for 24 hours was brushed over the reversed lids two or three times a day to cause purulent ophthalmia. This acute inflammation gradually ceases and improves the condition of pannus and granulations in some cases, but it must be regarded as an extremely dangerous remedy as the inflammation is entirely beyond control. In animals the eye is often completely destroyed by the application of *Abrin*. In modern medicine, *abrin* is no longer used. The following formula is beneficial in cases of paraplegia: Take of Abrus root 6, black sulphide of Mercuy 12, fruit of Margosa tree (*neem*), Cannabis Indica and Croton seed each two parts. Rub them together and make a paste in lime-juice. *Dose*: 3 to 6 grs. *Diet*: Rock salt (*Saindhava*) and Asafoetida are to be used. *Root* is sometimes used as substitute for liquorice.

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Abutilon indicum, G. Don. or *A. asiaticum*

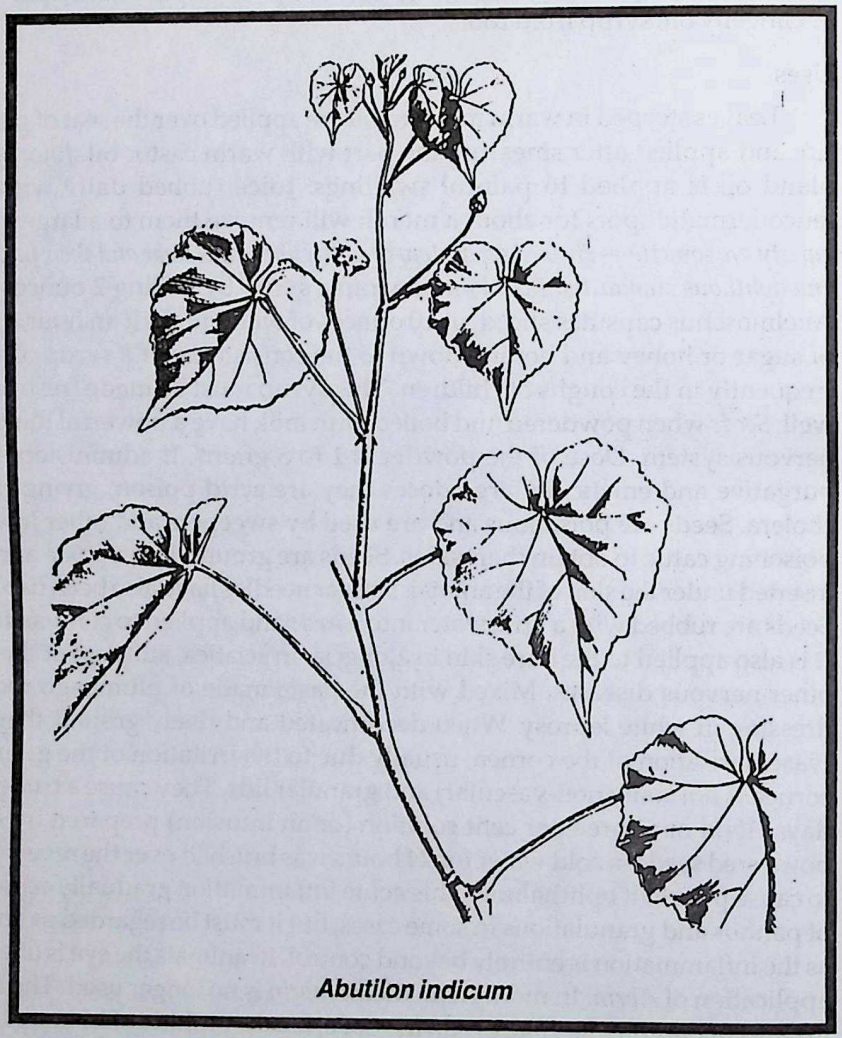
(Family: Malvaceae)

Vernacular Names

Sans.–Kotibala, Kankatika; *Hind.*–Kangahi, Kanghi, Kanghani; *Eng.*–Country-mallow; *Punj. & Sind.*–Peelee-bootee, Atikhirate, Khapate; *Ben.*–Potaree, Petari, Potari, Jhumka; *Bom.*–Madmi, Chakrabhenda, Kangori, Kangoi; *Goa & Kon.*–Tupkadi; *Tam.*–Tutti, Thuththi, Peruntutti; *Mal.*–Pettaka, Uram; *Tel.*–Tutiri-chettu, Thuteribenda; *Guj.*–Dabali; *Goa*–Petari; *Malay.*–Tutta; *Can.*–Shrimudrigida; *Burm.*–Bon-khoye; *Arab.*–Mashtul-ghoul; *Pers.*–Darakhte-shanah; *Sinh.*–Anona, Anoda-gaha; *Bom. & Cutch.*–(seeds) Balbij.

Botanical Description

Soft-pubescent shrub; leaves simple, alternate, long-petioled, broadly ovate-cordate, acuminate, 2.5–8 × 2.7 cm, minutely stellate-hairy above, glaucous beneath, margin crenate-dentate; flowers yellow, axillary, solitary; staminal column stellate-hairy at base; schizocarp globose, mericarps 14–20, densely stellate-hairy; seeds ovoid or suborbicular.



Abutilon indicum

Habitat

Throughout tropical India and Ceylon.

Parts Used

Root, back, leaves, seeds and fruits.

Constituents

Leaves contain mucilage, tannin, organic acid and traces of *Asparagin* and ash, containing alkaline sulphates, chlorides, magnesium phosphate and calcium carbonate. Roots also contain *Asparagin*. The mucilaginous substance contained in the leaves yields to hot water.

Amino acids, glucose, fructose and galactose isolated from leaves β-pinene, caryophyllene, caryophyllene oxide, cineole, geraniol, geranyl acetate, elemene, eudesmol, farnesol, and borneol

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identified in oil eudesmol (22.0), geraniol (13.0) and caryophyllene (11.6%) identified in essential oil of flowers.

Leaves contained glucose, fructose, galactose as well as alanine, glutamic acid (1.42% each) and arginine and valine (1.2% each).

Action

Leaves are demulcent, aphrodisiac, laxative, diuretic, pulmonary and sedative. Bark is astringent and diuretic. Root is diuretic. Seeds are laxative, expectorant and demulcent. Mucilage yielded by leaves is diuretic and demulcent. Zinc can be reduced into a *Sindooram* which is specially useful for piles (Siddha system).

Siddha Action

Sweetish, seethaveeryam, demulcent, tonic, laxative, diuretic and sedative.

Preparations

Decoction of the seeds and bark (1 in 10). Mucilage of bruised leaves or mucilage yielded by leaves soaked in water. Decoction of leaves. Infusion of leaves or roots. Seeds finely powdered; dose 1-2 drachms.

Uses

Inclusion of leaves (or leaves soaked in water yield a mucilage) or of *roots* is prescribed as a diuretic and demulcent in fevers, chest affections, gonorrhoea and urethritis. Decoction of *leaves* is used as an eye-wash and as mouth-wash in toothache and in cases of tender gums and also in gonorrhoea; and internally for stone in the bladder (inflammation of the bladder). *Flowers* and leaves are a local application to boils and ulcers. Decoction of leaves is useful as a fomentation to painful parts. Leaves are used as a food in piles by Siddha physicians. *Juice* of leaves and ghee one tola each are given in catarrhal, bilious diarrhoea. *Seeds* are used in decoction in piles and coughs. They are distinctly useful in gonorrhoea, gleet and chronic cystitis. Seeds, finely powdered, can be given in doses of 1-2 drachms as laxative and expectorant. Seeds are burnt on charcoal and recta of children affected with thread-worm are exposed to the smoke. Infusion of roots is used in relieving strangury and haematuria; it is also useful in leprosy.

Acacia arabica, Willd. or *A. Ferruginea*

(Family: Mimosaceae)

Vernacular Names

Sans.–Vabboola, Vabbula, Barbara; *Pers.*–Kare-mugiian; *Eng.*–Indian gum-arabic tree, Babul tree; *Hind.*–Kikar; *Mah.*–Babul, Kala-babli; *Bom.*–Babhula; *Sind.*–Babhula; *Hind., Ben. & Punj.*–Babla, Kikar; *Duk.*–Kalikikar; *Guj.*–Kaloabaval, Baval; *Tel.*–Nallatumma, Barbaramu, Tuma; *Tam.*–Karuvael, Karuvelum; *Can.*–Karijali, Jali, Bauni; *Mal.*–Karuvelum, Babola; *Kon.*–Shameeruku; *Punj. & Kash.*–Sak; *Arab.*–Ammughilam, Ummughilam; *Pers. & Arab.*–(extract) Akakia.

Habitat

Common all over India in dry and sandy localities; plentiful in Western Peninsula, the Deccan and Coromandal Coast.

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Parts Used

Bark, gum, leaves, seeds and pods.

Constituents

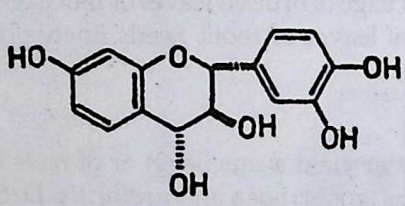
Gum contains arabic acid combined with calcium, magnesium and potassium; also small quantity of malic acid, sugar, moisture 14 per cent, ash 3-4 per cent. Bark contains a large quantity of tannin; pods contain about 22.44 per cent tannin.

Heartwood contains a mixture of 3 isomeric flavan-3,4-diols-(-)tetracacidin, isotetracacidin and mollisacacidin–a dihydroflavonol, flavanone, flavonol and chalcone with 4'7,8-trihydroxy pattern.

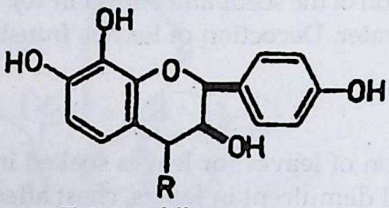
Distribution

Ornamental tree introduced from Australia and grown in gardens and on roadsides. Western and Southern India, Gujarat, Rajasthan, Karnataka and Tamil Nadu.

New Compounds



Mollisacacidin



Tetracacidin
R = β-OH
Isotetracacidin
R = α-OH

Autohydrolysis of purified gum removes rhamnose and arabinose residues rhamnose, arabinose, galactose, traces of xylose and aldobiouronic acid from gum.

A novel amino acid. N-acetyl-L-djenkolic acid, mp.170° - from seeds.

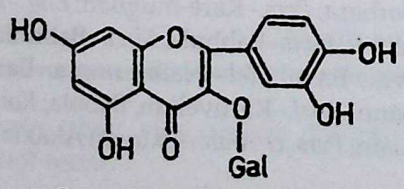
New Compounds

$$HOOCH(NHAc)CH_2SCH_2SCH_2CH(NH_2)COOH$$

N-acetyl-L-djenkolic acid

Quercetin-3-galactoside (hyperin or hyperoside). mp. 227-30°, from flowers; stigmast-7-enol and α-spinasterol from heartwood.

New Compounds



Quercetin-3-galactoside

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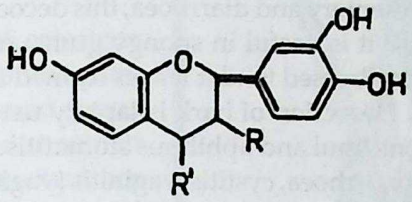
(-)Robinetinidol [(-)7.3′,4′,5′-tetrahydroxyflavan-3-ol], (+) catechin and (+)gal locatechin from bark; (+)fustin and fisetin from heartwood along with (-)fisetinidol, mp. 211°, leucofisetinidin and (+)mollisacacidin.

New Compounds

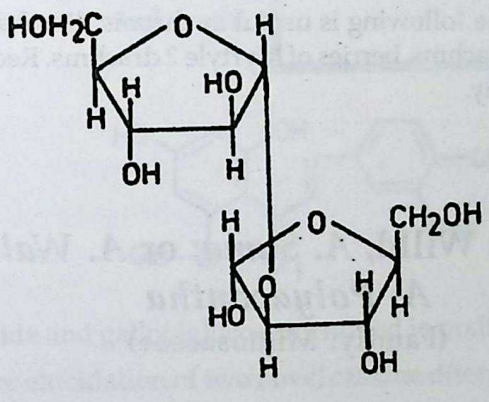


(-)Fisetinidol
R = α-OH, R' = H
Leucofisetinidin
R,R' = β-OH

The ethyl acetate-soluble fraction of plant extract exhibited toxicity to fungi comparable to that shown by condensed type tannins obtained from bark.

A new arabinobiose–2-O-β-L-arabinofuranosyl-L-arabinose–along with known 3-O-β-L-arabinopyranosyl-L-arabinose from gum; quercetin, gallic acid, (+)catechin, (-)epicatechin, (+)dicatechin, (+)leucocyanidin isolated; epigallocatechin, mp. 216°, from bark; degraded gum composed of recurring units comprising ten galactose residues and four glucuronic acid residues.

New Compounds



2-O-Arabinofuranosylarabinose

An aliphatic hydroxy compound, mp. 104°, a waxy substance, mp. 76°, a triterpenoid, mp. 182° and stigmasterol from bark; an amorphous substance from bark yielded acacinoic acid, mp. 280° and lupeol on hydrolysis.

Action

Astringent, demulcent, aphrodisiac; nutritive and expectorant. Bark is a powerful astringent. Pods, are expectorant. *Akakia* (extract of gum) is styptic, tonic and astringent.

Posology

Dose of gum and extract is 30 grains each.

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Uses

Tender growing tops rubbed into a *paste* with sugar and water and given morning and evening act as demulcent in coughs. Watery extract is injected to allay irritation in acute gonorrhoea especially in cases complicated with dropsy (when opium is prohibited) and leucorrhoea. Tender *leaves* beaten into a pulp are administered in dysentery and diarrhoea; this decoction is used in the same complaints as an astringent enema. As *gargle* it is useful in spongy gums, relaxed sore-throat and as wash in haemorrhagic ulcers and wounds. Bruised tender leaves formed into a *poultice* and applied to ulcers act as stimulant and astringent. Decoction of bark is largely used as a gargle and mouth-wash in cancerous and syphilitic affections, foul and aphthous stomatitis. It is a useful injection or as a local astringent douche or enema in gonorrhoea, cystitis, vaginitis (vaginal discharges), leucorrhoea, piles, prolapsus aniprolapsus uteri (prolapse of anus) etc. Infusion or decoction of the bark (1½ ounces of bark to one pint of water) is given, as an astringent tonic in chronic diarrhoea and diabetes melitus, in doses of 1½ to 2 ounces twice a day. Babul bark in combination with Mango bark, boiled for about half an hour in a pint of water forms a good preparation for mouth-wash. *Juice* of bark mixed with breast-milk is dropped into the eye in conjunctivitis. Burnt bark and burnt almond shell both pulverised and mixed with salt make a good tooth-powder. Gum is administered in the form of mucilage in diarrhoea and dysentery and also in diabetes mellitus, as the gum is not converted into sugar. *Powdered gum* mixed with quinine is useful in fever cases complicated with diarrhoea and dysentery; mixed with the white of an egg it is applied to burns and scalds. Powdered gum is also used to arrest haemorrhages. Fried in ghee, the gum is useful as a nutritive tonic and aphrodisiac in cases of sexual debility. In the form of mucilage the gum is a most common and useful adjunct to other medicines in pulmonary and catarrhal affections, and in irritable states of the genito-urinary organs. Slight cases of cough or irritation of, throat are often relieved by a piece of gum allowed to dissolve slowly in the mouth. Gum is an efficient substitute for true gum acacia.

Pods are used in coughs. The following is useful in chronic diarrhoea, dysentery and passive haemorrhages: Take of *Akakia* 2 drachms, berries of Myrtyle 2 drachms. Reduce these to a fine powder. *Dose*: grs. 10 to 30 three times a day.

Acacia catechu, Willd, *A. Suma*; or *A. Wallichiana* or *A. Polyacantha*

(Family: Mimosaceae)

Vernacular Names

Sans. Mah. & Can.–(extract) Khadira; *Eng.*–Catechu, Black Catechu; *Hind.*–Khair, Katha , Kottha Fooflee Sooparee (Dye); *Mah. & Ben.*–Khair, Khayer; *Bom.*–Khaira, Khaderi; *Gwalior.*–Khair; *Guj. & Duk.*–Kher; Kath-Khar; *Tel.*–Podalimanu, Poogamu, Kachu (dye), Kaviri-sandra; *Tam.*–Voadalam, Karangalli, Kasku–kutta, Wothalay, Kashra-katti (dye); *Mal.*–Khadiram; *Kon.*–Kathu; *Can.*–Kachu (dye); *Santal.*–Khaiyar; *Assam.*–Khoira; *Uriya.*–Khoiru; *Sinh.*–Ratkihiri; *Burm.*–Sha.

Habitat

Common in forests of India and Burma. Lighter, variety of catechu is an imported one from Malaya and Singapore and is derived from Uncaria gambier.

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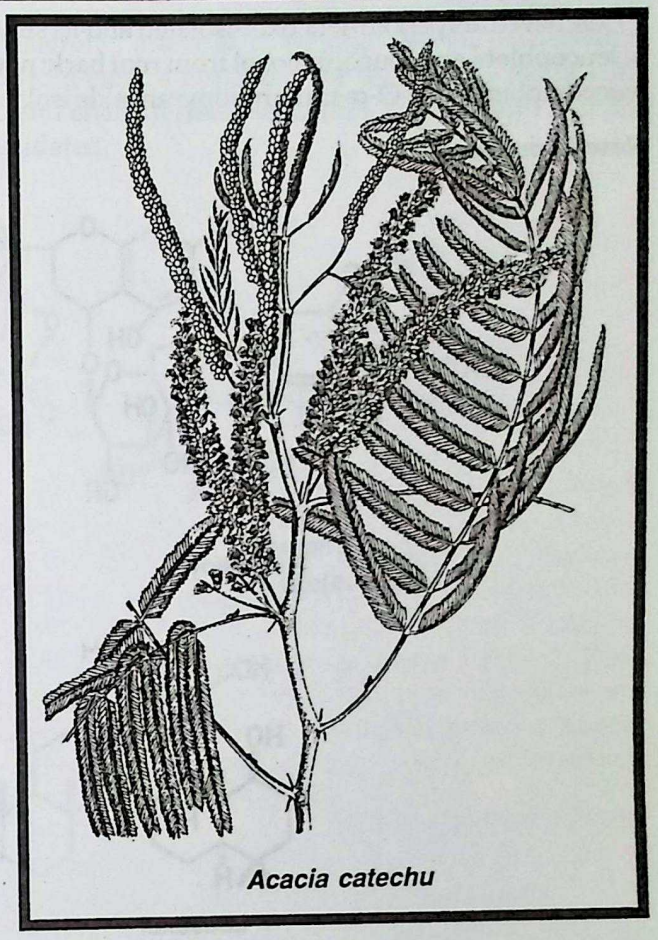
Parts Used

Extract, bark, wood, flowering tops and gum.

Constituents

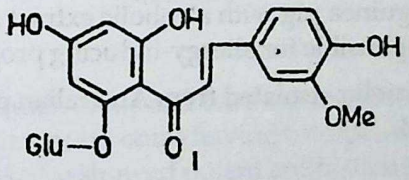
Catechu-tannic acid 35 per cent, catechuic acid or catechin; catechu red, tannin, gum, quercetin and ash. Catechu-tannic acid occurs as a dark reddish-brown powder which oxidises in the air. Dye extracted from the inner wood is a brittle compact substance of chocolate colour containing much tannin, and an acid called catechuic acid, it has a stringent taste but no smell and is soluble in water. Dye occurs in dark-brown masses with a very astringent taste.

A new anthochlor pigment - 4,2′,4′,6′-tetrahydroxychalcone-2′-xyloside–isolated along with isosalipurposide (4,2′,4′,6′-tetrahydroxychalcone-2′-glucoside); a new chalcone - 2′,4.4′,6′-tetrahydroxy-3-methoxy-chalcone-2′-O-β-D-glucoside (I) - along with cernuoside isolated from flowers; new pigment–chalcononaringenin-2′-O-rhamnosyl-(1→4)-xyloside isolated from flowers.



Acacia catechu

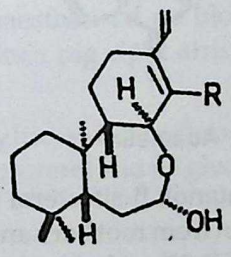
New Compounds



Kaempferol-7-glucoside and galloylglucose identified in pods.

Isolation and structure elucidation of two novel cassane diterpenoids (I, II) from roots.

New Compounds



I

R = Me

II

R = CHO

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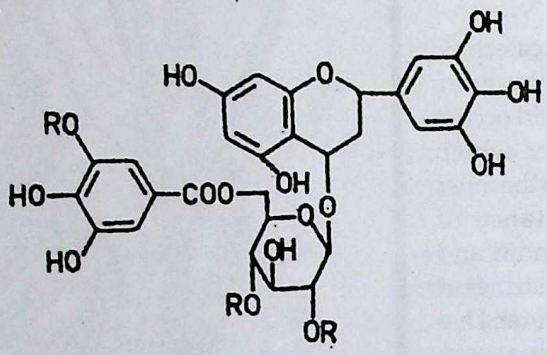
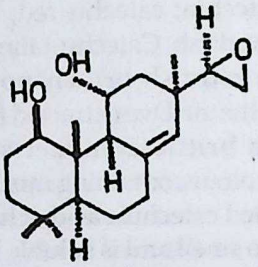
A new diterpenoid-leucoxol-isolated and its structure determined; isolation and characterisation of leucophleol and leucophleoxol from root bark; new tannin (I) - along with isookannin, cyanin and leucodelphinidin-3-O-α-L-rhamnopyranoside isolated from bark; its structure elucidated.

New Compounds

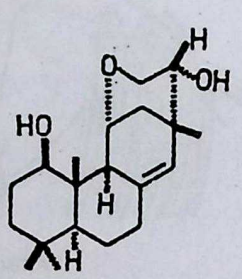


I

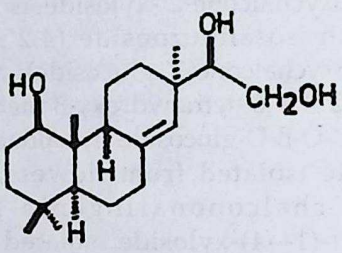
R = Galloyl



Leucophleoxol



Leucoxol

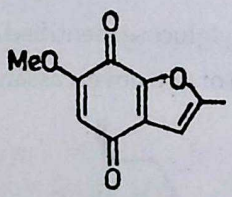


Leucophleol

Sensitising experiments in guinea pig with alcoholic extract and various fractions showed that quinonoid constituents were responsible for allergy-inducing property of plant.

A new furanoquinone - acamelin - isolated from Australian plant, along with 2,6-dimethoxy-p-benzoquinone and characterised.

New Compounds



Acamelin

Hentriacontane, lapachol, n-hentriacontanol, β-sitosterol and paulownin isolated from roots; octacosanol, β-amyrin, β-sitosterol and betulin from root bark and β-sitosterol and β-amyrin from root heartwood; capric (0.12), lauric (0.07), myristic (0.32), palmitic (0.51), stearic (16.12), oleic (34.78), linoleic (44.07) and arachidic (4.01%) acids detected in seed fatty oil by GLC.

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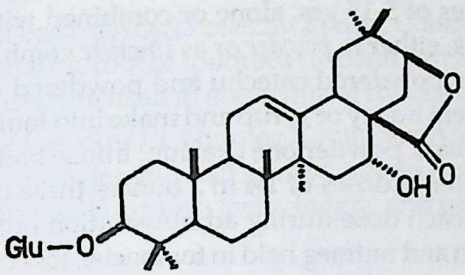
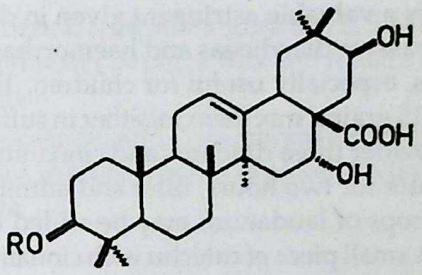
Lupeol, α-spinasterol, hexacosanol, α-spinasterone, acacic acid lactone and an unidentified saponin, spermicidal to human semen, isolaled from bark; a nortriterpene -acacidiol - along with acacic acid lactone 3-acetate isolated from pods and characterised; sonunin I and sonunin II along with acacic acid isolated and their structures elucidated.

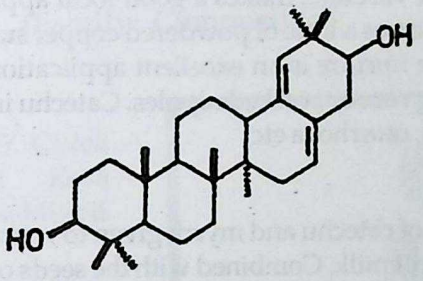
New Compounds



Sonunin I



Sonunin II
R = Glu(4→1) Glu



Acacidiol

Biological Activity

Saponins from roots, leaves, fruits, seeds and bark exhibited moderate degree of non- specific spasmolytic activity in guinea pig ileum; saponins having triterpenoid moiety were more active than those with steroid moiety. Saponins also showed potent antihistaminic activity.

N-Methyltyramine from seeds.

Biological Activity

N-Methyltyramine increased anaesthetised rat blood pressure, relaxed guinea pig ileum and increased both force and rate of guinea pig right atrium contraction by inducing noradrenaline-release.

β-Amyrin, β-sitosterol and its glucoside, erythrodiol and sucrose isolated from stem bark; kaempferol, quercetin, β-amyrin, β-sitosterol and its glucoside from fruits.

Stigmasterol from bark.

Action

Powerful astringent.

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Preparations

Gum-catechu, powder, tincture and decoction. *Catechu* is a resinous extract prepared from the wood by boiling it in water and inspissating the decoction.

Uses

Catechu is chiefly used in India as an ingredient of the packet of betel leaves chewed by the people. It is a valuable astringent given in doses of 5-15 grs. alone or combined with cinnamon or opium in passive diarrhoeas and haemorrhages, either in *powder* or as *tincture* combined with other astringents, especially useful for children. Take powdered catechu and powdered cinnamon bark each 10 or 15 grains, mix them together in sufficient honey or syrup and make into four pills; or take of catechu powder three drachms and cinnamon-bark powder one drachm; infuse both in half pint of boiling water for two hours; filter and administer in doses of 1½ to 2 ounces three times a day. For adults 5 drops of laudanum may be added to each dose during administration but not for young children. A small piece of catechu with cinnamon and nutmeg held in toothache, loss of voice etc., also in cases of mercurial salivation, lozenge and is of great service in hoarseness, relaxed sore throat, toothache, loss of voice etc., also in cases of mercurial salivation, bleeding, ulcerations and sponginess of the gums. In toothache it is employed to stuff the hollow of the aching tooth. An ointment, one drachm to an ounce of lard or vaseline, makes a good local application to chronic ulcerations with foetid discharges; in obstinate cases a little of powdered copper sulphate (15 grains to the, ounce of the ointment) may be added. The *tincture* is an excellent application for threatened bed sores and the decoction is useful for washing sore or cracked nipples. Catechu in the form of *injection* is useful in the treatment of gonorrhoea, otitis, otorrhoea etc.

Some More Preparations

1. *Kath-bol* is a mixture of catechu and myrrh given to women after confinement, as a tonic and to promote secretion of milk. Combined with the seeds of Bonducella and with Ferri sulphas it is useful for strengthening gums.
2. *Kathlon* is a confection containing the bark of Acacia Catechu, rose-buds and sugar.
3. *Svalpakhadiravatika* is a favourite medicine in diseases of the mouth and gums. To prepare it, take of catechu twelve seers and a half, water sixty-four seers, boil down to eight seers then add nutmeg, camphor, betel-nuts and *kakkola* each half a seer in fine powder and prepare a mass fit for being made into boluses. They are directed to be kept in the mouth in affections of the teeth, gums, palate and tongue (Chakradatta).
4. The following decoction, called *Khadirastaka* is prescribed for internal use in boils, prurigo, measles and other skin diseases: Take of catechu, the three myrobalans, nimbark, leaves of *Trichosanthes Dioica, gulancha* and *Adhatoda Vasica* equal parts and prepare a decoction in the usual way.
5. Sarangadhara describes a fermented liquor called *Khadirarishta* for use in skin diseases. It is prepared with catechu and the wood of *Pinus Deodara* and some other ingredients in smaller proportions.
6. In the Koncan juice of the *fresh bark* is given with Asafoetida in haemoptysis and juice of the flowering-tops 2 tolas with cumin ½ tola, milk and sugar in gonorrhoea, syphilis and heat of the body.
7. For leprosy, a decoction of the five parts of the plant, *viz.*–the root, leaf, flower, bark and fruit is given a drink with food; it is also used externally for bathing the affected parts; locally to the ulcers an ointment of catechu is applied. The following are a few more formulae for household use:

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8. Take of catechu 5 parts, asafoetida 4, *Papadkhar* (carbonates of potassium and sodium) 3, opium 2 parts. Mix and make a pill mass. *Dose*: grs. 5 to 10. Given in the juice of betel-leaf in chronic dysentery.
9. Take of Catechu, three myrobalans, bark of *neem* or Margosa tree, root of Cocculus villosus, Cocculus cordifolius and leaves of Adhatoda vasika, all equal parts. Prepare a decoction. *Dose*: half to one drachm. Useful in Prurigo and other skin diseases.
10. Take of bark of Acacia catechu 2 parts, Conessi bark 2, bark of Margosa tree 2, Sweet flag root 2, Triphala 2, root of Ipomoea turpenthum 2 and water 20 parts. Mix and make a decoction. *Dose*: drachm used in gonorrhoeal rheumatism.
11. Take of Catechu 10, Nutmeg, Camphor, Areca-catcchu and Cardamoms each 2 parts. Mix, make a powder and add gum of Acacia Arabica to make a bolus to be kept in the mouth in affections of the gums, teeth, tongue and palate.

Achillea millefolium, Linn.
(Family: Compositae)

Vernacular Names

Bom.–Rojmari; *Ind., Baz. & Cutch.*–Biranjasif; *Afg.*–Buimaderan; *Kash.*–Momadruchopandiga; *Eng.*–Yarrow, Milfoil.

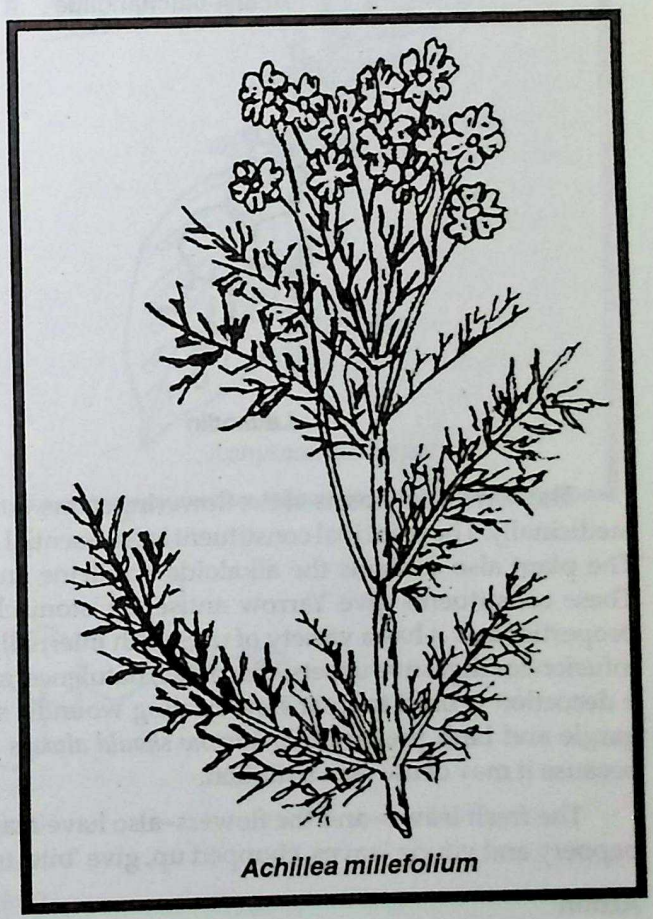
Botanical Description

A perennial herb with a creeping rhizome and erect, furrowed and downy stems. The dark-green basal and stem leaves are lanceolate and finely divided (two or three times pinnate). The small flower heads are clustered in dense, flat corymbs. The ray-florets are white or occasionally pinkish; the disc-florets whitish. The fruit, an achene, is strongly compressed and slightly winged. All parts of the plant have a characteristic strong smell.

Habitat

Herb abounds in the Himalayas from Kashmir to Kumaon.

Yarrow is common throughout Europe and Asia in hedgerows and fields and on dry banks and roadsides. It is native to the British Isles. The plant's healing properties were known to the ancient Greeks who named Yarrow *Achillea* after Achilles, the legendary heroic warrior. The



Achillea millefolium

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specific name *millefolium* (='a thousand leaf') refers to the plant's many feathery leaves. The common name Yarrow is derived from the Anglo-Saxon word *gearwe*, but the meaning of this is not known.

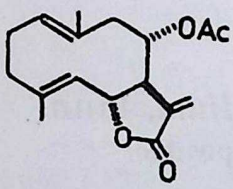
Parts Used

Leaves, flower-heads.

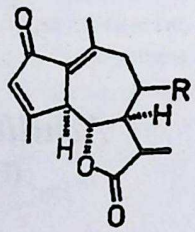
Constituents

Essential oil, HCN-glucoside achillein. Luteolin-7-glucoside; matricarin, deacetylmatricarin and two new sesquiterpene lactones - achillin, mp. 158° and 8-hydroxyachillin, mp. 161°; betonicine, L-(-)stachydrine, betaine, choline and base C, mp. 200° and S- and N- containing substance, mp. 266°, isolated; acetyl-balchanolide, mp. 125°, millefolide, mp. 138° and another lactone, mp. 138°, apart from α- and β- humulenes from flowers, leukodin and achillin isolated.

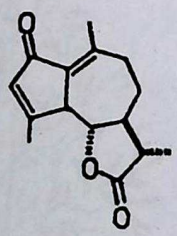
New Compounds



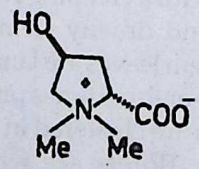
Acetyl-balchanolide



Achillin
R=H,H
8-Hydroxyachillin
R = H,OH



Leukodin



Betonicine

The non-woody parts of the flowering stems, sometimes only the flowers, free of stalks, are used medicinally. The principal constituent is an essential oil with azulenes that turn blue after distillation. The plant also contains the alkaloids achilleine and stychydrine, tannins and bitter compounds. These constituents give Yarrow antiseptic, stomachic, antispasmodic, astringent and diaphoretic properties and it has a variety of uses both internally and externally. For example, herbalists use an infusion for digestive upsets, diarrhoea, flatulence, menstrual disorders, colds and fevers. Externally a decoction is used to treat slow-healing wounds, skin rashes and eczema, chapped skin and as a gargle and bath preparation. *Yarrow should always be taken in moderation and never for long periods* because it may cause skin irritation.

The fresh leaves–and the flowers–also have many cosmetic uses. The taste is slightly bitter and peppery and young leaves, chopped up, give 'bite' to a mixed salad.

Action

Stimulant, tonic, carminative.

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Uses

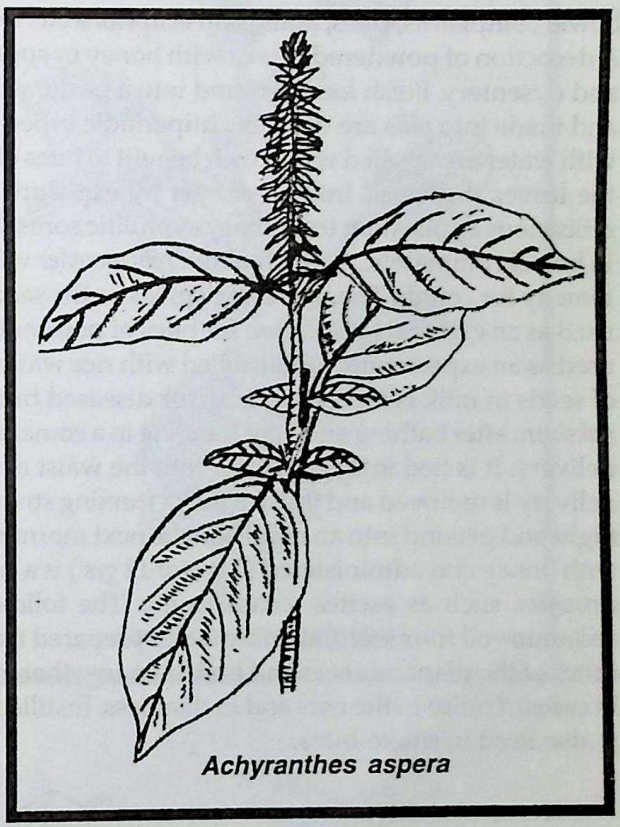
Powdered leaves and flowers-heads are useful as carminative and tonic in 5-30 grs. doses. Hot infusion of leaves is a powerful emmenagogue.

Achyranthes aspera, Linn.

(Family: Amarantaceae)

Vernacular Names

Sans.–Aghata, Khara-manjari, Apamarga; *Eng.*–Rough Chaff tree, Prickly chaff-flower; *Ben.*–Apang; *Burm.*–Kune-lamon; *Duk.*–Agari; *Guj.*–Safed Aghedo; *Mah.*–Aghada, Pandhara-aghada; *Tel.*–Uttaraene, Antisha, Apamargamu; *Hind.*– Latjira, Chirchira; *Tam.*–Shiru-kadaladi, Nayuruvi; *Mal.*–Kadaladi, Katalati; *Can. & Kon.*– Uttaranee; *Arab.*–Atkumah; *Pers.*– Khare-vazhun; *Gwalior.*–Adharajhada; *Punj.*–Kutri.



Achyranthes aspera

Habitat

Small herb found all over India.

Parts Used

Herbs, leaves, seeds and roots.

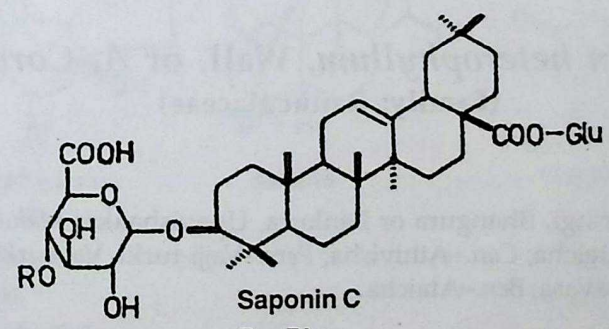
Constituents

Fruit contains a large percentage of alkaline ash containing potash.

Unripe fruits used in treatment of respiratory diseases.

Two new saponins C and D isolated from fruits and their structures elucidated.

New Compounds



Saponin C
R = Rha
Saponin D
R = Glu (4→2)Rha

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Action

Astringent, diuretic, alterative and antiperiodic, purgative.

Preparations

Decoction and infusion of leaves; *Khar* prepared by incineration of the plant; powder of root, paste and medicated oil.

Uses

Decoction (2 oz. of the plant in 1½ pints of water boiled for 20 minutes to half an hour and then strained) is a good diuretic found efficacious in renal dropsies and general anasarea; one to two ounces of the mixture is given two or three times daily, the leaf juice is also useful in stomach ache and bowel complaints, piles, boils, skin eruptions etc. in large doses it produces abortion or labour pains. A decoction of powdered leaves with honey or sugar candy, is useful in the early stages of diarrhoea and dysentery. Fresh *leaves* ground into a paste with jaggery or mixed with black pepper and garlic and made into *pills* are used as antiperiodic especially in quartan fevers; leaves rubbed into a *paste* with water are applied with much benefit to bites of poisonous insects, wasps, bees etc. Fresh juice of the leaves thickened into an extract by exposure to the sun and mixed with a little opium is an efficacious application to primary syphilitic sores. An *Infusion of the root* is given as a mild astringent in bowel complaints. A pinch of the *root-powder* with a pinch of pepper powder and honey is a nice remedy for cough. The flowering spikes or the seeds, ground and made into a paste with water, are used as an external application for bites of poisonous snakes and reptiles. *Spike* with the *seeds* is often used as an expectorant. Seed rubbed with rice water is given in bleeding piles. *Payasam* or *Kheer* made of seeds in milk is a good remedy for diseased brain. Root taken on Sunday conjoined with *pushya nakshitra* after bathing and kept hanging in a comer is used in stimulating labour pains and expediting delivery. It is tied into the hair or into the waist of the woman in pains. The root immediately after delivery is removed and thrown into a running stream of water. Seed soaked in butter-milk during the night and ground into an emulsion the next morning is a cure for biliousness. *Ashes of the root* rubbed with honey and administered (2 *vals or 12 grs.*) is a cure for cough. Ashes with water and jaggery cures dropsies such as ascites, anasarca etc. The following is the formula for *Apamarga Taila*–Take of sesamum-oil four seers, alkaline water prepared from the ashes of Achyranthes aspera sixteen seers, ashes of the plant one seer and boil them together in the usual way. This oil is poured into the meatus in cases of noise in the ears and in deafness. Instilled into the nostrils it cures nose-bleeding. The drug is also used in snake-bites.

Aconitum heterophyllum, Wall. or *A. Cordatum*

(Family: Ranuculaceae)

Vernacular Names

Sans.–Ativisha, Sitashringi, Bhangura or Pankura, Upavishaaka; *Mah.*–Ativisha, Visha; *Eng.*–Indian atees; *Hind.*–Atis, Ateicha; *Can.*–Athivisha; *Pers.*–Vajji-turki, Vaj-turki; *Tel.*–Ativasu, Atirasa; *Tam.*–Ativadayam; *Guj.*–Atavasa; *Ben.*–Ataicha.

Habitat

Sub-alpine and Alpine Zones, the Himalayas from Indus to Kumaon.

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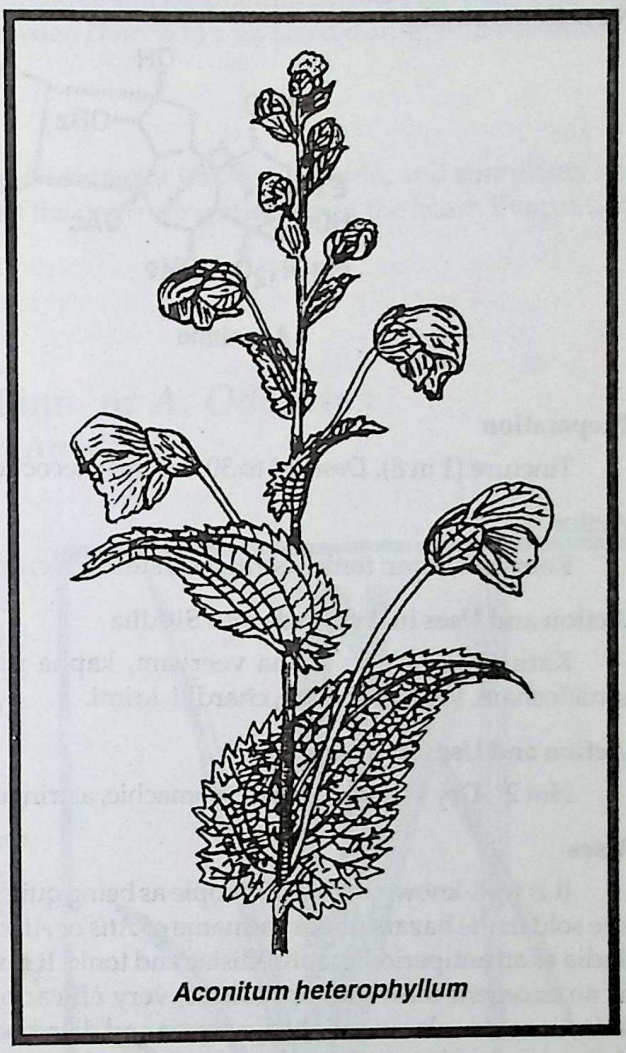
Parts Used

Dried tuberous roots.

Constituents

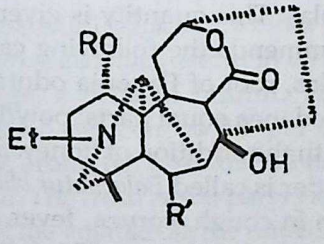
The non-crystalline (amorphous) intensely bitter alkaloid, atisine which is non-toxic; aconitinic acid, tannic acid, pectous substance, abundant starch, fat, a mixture of oleic, palmitic, stearic glycerides, vegetable mucilage, cane-sugar and ash 2 per cent. Chemical assay of A. heterophyllum and A. lycoctonum varieties shows that the alkaloid content of the so called Ferox form (A. dinorrhizum and A. balfourii combined) is double that of the European variety of A. napellus official in the Pharmacopoeia and that of the Indian Napellus variety (A. chasmanthum) is ten times as much. Biological assay of these roots shows that the ether soluble alkaloid (pseudo-aconitine) of the so-called Ferox form is 1.5 times stronger than aconitine obtained from the European variety of napellus (A. chasmanthum) and the alkaloids obtained from the Indian variety of napellus (A. chasmanthum) are 0.7 times weaker.

Structure and absolute stereochemistry of atisine; chemical studies on hetisine; structure of heteratisine proposed; heterophyllisine, mp. 178°, heterophylline, mp. 221°, heterophyllidine, mp. 269°, hetidine, a new atidine and hetisinone from roots.

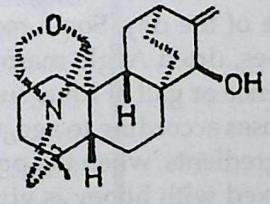


Aconitum heterophyllum

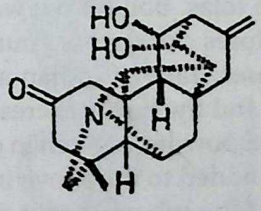
New Compounds



Heterophyllisine
R = Me, R' = H
Heterophylline
R,R' = H
Heterophyllidine
R = H, R' = β-OH



Atisine



Hetisinone

Neoline, mp. 160°, isolated; structure of aconitine established; absolute configuration of neoline.

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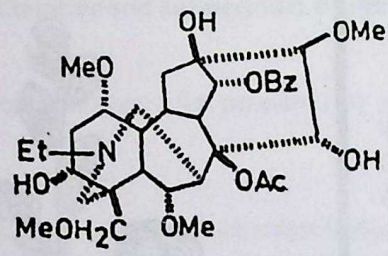
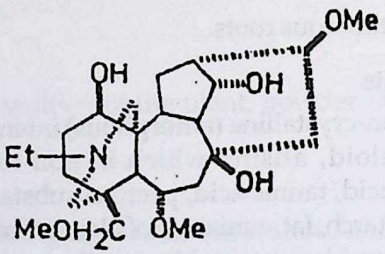
New Compounds



Aconitine



Neoline

Preparation

Tincture (1 in 8). *Dose*: 10 to 30 minims; decoction; powder of root, *Dose*: 10 to 30 grains.

Action

Roots are bitter, tonic, astringent, stomachic, antiperiodic and aphrodisiac.

Action and Uses in Ayurveda and Siddha

Katu tikta rasam, ushna veeryam, kapha pitta haram, dipanam, pachanam in athisaram, amadosham, kasam, visham, chardhi, krimi.

Action and Uses in Unani

Hot 2°, Dry 1°, aphrodisiac, stomachic, astringent, balgham, piles, dropsy, vomiting, safra.

Uses

It is well-known to the hill people as being quite inert and it is eaten by them as a vegetable. Roots are sold in the bazars under the name of *Atis* or *Atees*. The alkaloid *atisine* is employed medicinally in India as an antiperiodic, aphrodisiac and tonic. It is valuable for combating debility and after fevers it is an excellent tonic and aprodisiac; very efficacious in diarrhoea, dysentery, acute inflammatory affections etc., also in cough, dyspepsia and diarrhoea depending thereon. In fever with diarrhoea the following decoction is recommended: Take of *A. heterophyllum*, ginger, Holarrhena, antidysenterica bark, tubers of Cyperus rotundus and root of Cocculus cordifolia equal parts, in all two tolas, water thirty-two tolas. Boil till the water is reduced to eight tolas. This quantity is given in two or three divided doses during the course of the day. Some recommends the following called *Hriveradi* in similar cases: Take of Indian atees, dried Aegle marmelos, root of Pavonia odorata and Cyperus rotundus and the horny excrescence or gall of Rhus succedanea equal parts; powder and mix. This compound powder is given in doses according to age, with the addition of honey. Sometimes, long-pepper is added to the above ingredients, when the powder is called *Balachatur bhadraka*. The plain powder of the tuberous root mixed with honey is given in cough, coryza, fever and vomiting of children; it is applied to the tounge, dose being strictly according to age. The following are a few simple home remedies:

1. Take of aconite root 1 dr., Bonduc nut 2 drs., reduce to a fine powder and mix. *Dose*: grs. 10 to 20. Used in bilious fever.
2. Take of aconite root, *Mustaka*, the gall of Rhus succedanea and long-pepper equal parts. Mix and make a powder. *Dose*: 1 drachm for adults and ¼ to ½ dr. for children. Used in fever, diarrhoea and irritability of the stomach.

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3. Take of aconite root, chiretta, Cyperus rotundus and Delphinum denudatum each 1 dr., and Cocculus cordifolius 2 drs. Mix and powder. *Dose*: ½ to 1 dr. Used during intermissions of feverish attacks.

Antidotes

Antidotes to aconite poisoning are tannic acid-astringent infusion, atropin, and stimulants like alcohol and ammonia; Digitalis also to counteract the depressing effect upon the heart. Evacuation, artificial respiration, warmth and friction.

Acorus calamus, Linn. or *A. Odoratus*
(Family: Aroideae)

Vernacular Names

Sans.–Vacha, Shadgranthagolomi, Ugragranthi, Jatila; *Eng.*–Sweetflag; *Hind.* & *Ben.*–Bach, Gorabach; *Pers.*–Agri-turki; *Duk.*–Vach; *Guj.*–Godavaj; *Bom.*–Vaj; *Mah.*–Vekhand; *Tel.*–Vasa; *Tam.*–Vashambu; *Can.*–Baje; *Mal.*–Vayambhu; *Kon.*–Ekhanda.

Habitat

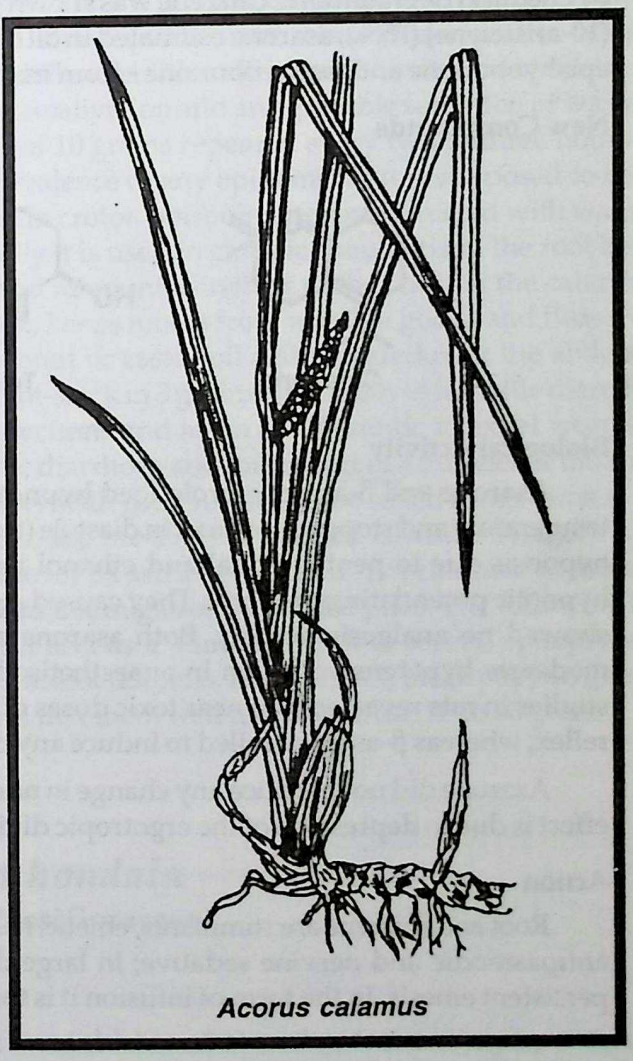
A semi–aquatic perennial cultivated in damp marshy places in India and Burma. Exceedingly common in Manipur and the Naga Hills, and on the edges of lakes and streams.

Parts Used

Dried rhizome.

Constituents

A volatile essentia1 oil, *acorin*, a bitter principle *acoretin* (choline), *Calamine* (useful in dysentery), starch, mucilage, a little of tannin. The dried rhizome yields 1.5 per cent to 2.7 per cent of a neutral, yellow, aromatic, essential oil having an agreeable odour. The fresh aerial parts yield about 0.123 per cent of the volatile oil; the unpeeled roots, however, give a much better yield from 1.5 to 3.5 per cent. Acorin, a glucoside is a honey-like liquid, very bitter and aromatic, soluble in alcohol, chloroform, ether, splitting into sugar and volatile oil. Acoretin is a resin-like body yielding by reduction ethereal oil and sugar. Calamine is a



Acorus calamus

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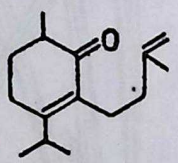
cystalline alkaloid soluble in alcohol and chloroform. The valuable essential volatile oil of Acorus Calamus is yellowish-brown, and is found to be composed of asaryl-aldehyde, free normal ($C_7H_{14}O_2$) heptylic and ($C_{16}H_{32}O_2$) palmitic acid, eugenol, esters of acetic and palmitic acids, pinene; camphene; sesqui-terpene, calamene $C_{15}H_{24}$ (2.3%); and a small quantity of phenol; Eugenol $C_{10}H_{12}O_2$ (0.3%); Methyl Eugenol $C_{11}H_{14}O_2$ (1.2%); Calamenenol $C_{15}H_{24}O$ (5.3%) and Calameone $C_{15}H_{26}O_2$ (2.2%), the crystalline body named *Calameone asarone*. The oil obtained from the Indian A. calamus was studied by Rao, Sudborough and Waston (1925), and they found that this oil does not contain the lower boiling constituents such as pinene, camphene, etc., in the commercial oil from Europe. The oil mainly consists of asarone $C_{12}H_{16}O_3$ (82%); Palmitic acid was also found in the combined condition along with a small quantity of buturic acid. Properties of oil of Indian A. calamus have been found as follows: Specific gravity 1.069 at 15°; optical rotation 16.2°; saponifcation value 5.1; saponification value after acetylation 16.6; acid value 1.4.

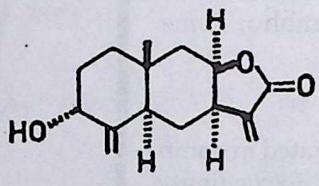
Essential oil showed spasmolytic activity in animals which was approximately 10% of that of papaverine.

Structure of calacone from oil confirmed by synthesis; structure of telekin and isotelekin established by chemical degradations; calarene was shown by GLC to contain 9-aristolene (25%) and β-gurjunene (10-aristolene) (75%); asarone estimated in oil by chromatography; monocyclic ketones - shyobunone, epishyobunone and isoshyobunone - from essential oil of rhizome.

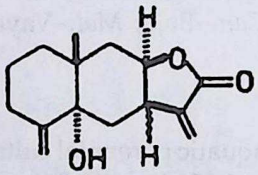
New Compounds



Calacone



Telekin



Isotelekin

Biological Activity

Asarone and β-asarone prolonged hypnotic activity of anaesthetic agents, caused fall in rectal temperature and stoppage of heart in diastole (frog) and showed anticholinergic action. Both prolonged hypnosis due to pentobarbital and ethanol in mice; LSD_{25} and iproniazid failed to influence this hypnotic potentiating property. They caused significant reduction in rectal temperature of mice and showed no analgesic activity. Both asarone and β-asarone showed cardiac depressant activity, moderate hypotensive action in anaesthetised dogs and antiacetylcholine activity. Acute toxicity studies in rats revealed that near toxic doses of asarone caused ataxia, hypnosis and loss of righting reflex, whereas β-asarone failed to induce any of these responses.

Asarone did not produce any change in noradrenaline content of whole brain of rats. Its sedative effect is due to depression of the ergotropic division of the hypothalamus.

Action

Root and rhizome are stimulants, emetic, nauseant, stomachic, aromatic, expectorant, carminative, antipasmodic and nervine sedative; in large doses *i.e.*, 30 to 40 grains it produces a violent and persistent emesis. In the form of infusion it is tonic, stomachic or carminative, also anti-periodic. The

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volatile oil is aromatic and antiseptic. The rhizome has an expectorant action, due to the presence of the essential oil.

Action and Uses in Ayurveda and Siddha

Katu rasam, tiktanursam, ushna-veeryam, vata-haram, emetic. Improves agni, clears urine and stools. In krimí, adhmanam, colic, insanity due to kapha.

Action and Uses in Unani

Hot 3° Dry 2°, cleans brain, aphrodisiac, strength to sight, expels reeh, expels balgam, antipoison, paralysis, dropsy, and nervous complaints, digestive, cold, coughs.

Preparation

Powder. *Dose*: 5 to 20 grains; and infusion (1 in 10 parts of boiling water), *dose*: 1 to 2 ounces.

Uses

Given in the form of *infusion* it is useful in dyspepsia, flatulence, loss of appetite etc., and also in atonic and choleraic diarrhoea of children; as antiperiodic it is given in tertian fevers. It is also beneficial in hysteria and neuralgia. With the addition of a little liquorice root it is administered in cases of cough, fever, capillary bronchitis colic, etc., especially in children. In cases of irritation of the throat and cough the root simply *chewed* produces copious salivation and an agreeable sensation of warmth; in asthma it is found useful given in small doses of 10 grains repeated every two or three hours till relief is obtained. It is eaten freely during the prevalence of any epidemic as it is supposed to be an antidote for several poisons including snake-bite. In croton poisoning its *powder* mixed with water is given to counteract the poisonous effect. *Externally* it is used in chronic rheumatism, the root being powdered and rubbed up with cachew spirits and as counter-irritant to the chest in the catarrh of children; the powder is a very effective insecticide, keeps moths from woollen goods and fleas from rooms. The root burnt to cinder, mixed with coconut or castor oil and smeared over the abdomen relieves flatulent colic. The powder of the burnt root-stock in 3 grain doses relieves infantile diarrhoea and colic. It is used as a diuretic in calculous affections and as an anthelmintic to expel worms in children. The drug is a very old remedy for chronic diarrhoea and forms part of a number of mixtures used in Ayurveda. Some tried it in chronic dysentery with good results. Some tested it and came to the conclusion that whatever action it had was due to the presence of tannins. Chemically, there is no other constituent which might be held responsible for its astringent action. The rhizome with *bhang* and *ajowan* in equal parts is powdered and used as a fumigation to painful piles. The following is a valuable compound powder useful in dyspepsia and as a stimulant in low fevers, epilepsy and insanity: Take equal parts of acorus calamus root, asafoetida, *atis*, long-pepper, black papper, ginger, chebulic myrobalan and sonchal salt. Powder and mix them well together. *Dose*: 20 to 60 grains.

Adenia hondala

(Family: Passifloraceae)

Botanical Description

Tendril climber with large tuberous roots; stem thickened at nodes; leaves simple, alternate, palmately 3-5 lobed 14 × 10 cms, glabrous with two discoid glands at the base of the lamina and one

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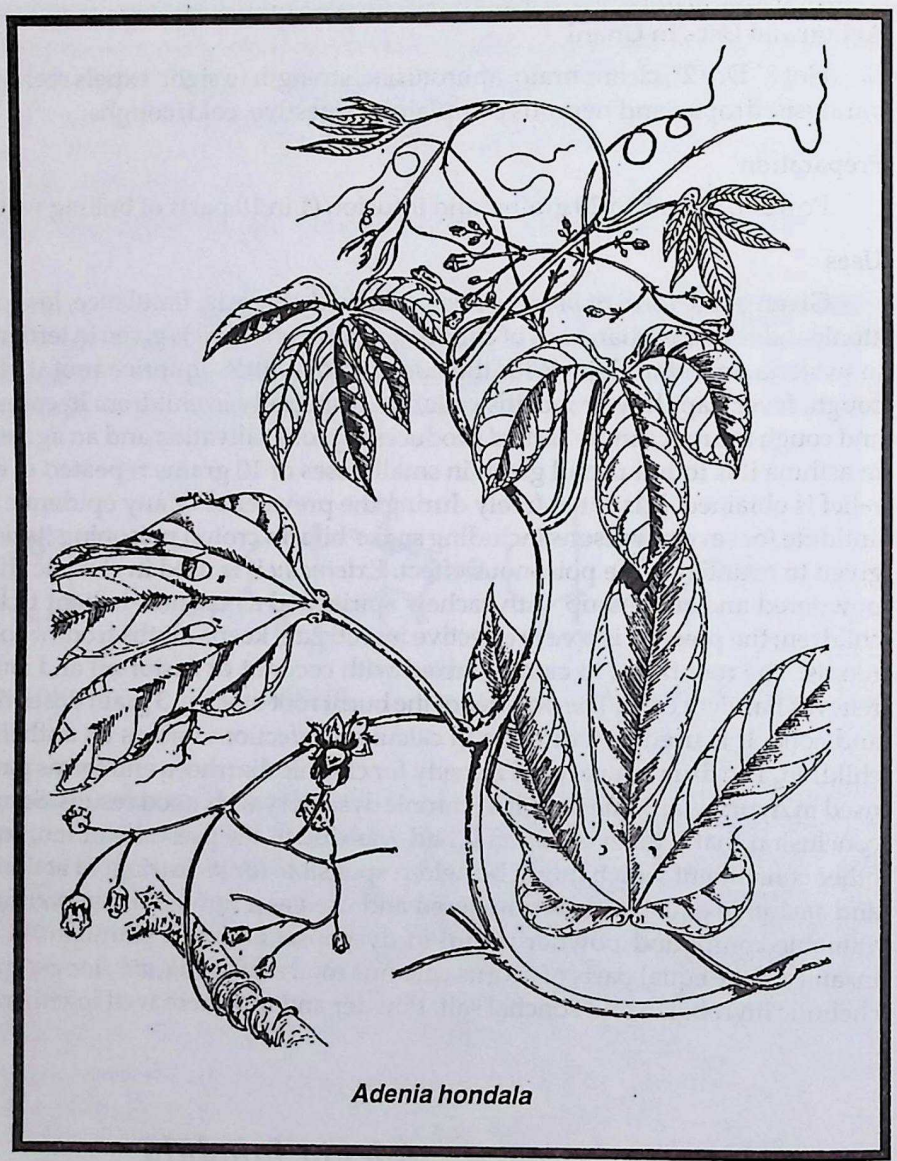
on each sinus between the lobes; stipules hard and horn-like; flowers creamy yellow, unisexual, in axillary monoecious cymes, calyx tube campanulate, lobes 4-5; petals 4-5 attached to the base of the calyx tube. Male flowers: stamens 4-5, filaments united into a cup below, anthers long, ovary rudimentary; Female flowers: staminodes 4-5, ovary subsessile, ovules numerous attached to parietal placenta; fruit a 3-valued capsule, 5 cms long.

Habitat

The plant is found in the hills of Karnatic, Western Ghats and W. Coast.



Adenia hondala

Uses

Vidari is an important constituent of many Ayurvedic formulations and according to the texts, the drug source is the subterranean tubers (*varahikanda, vidarikanda*) of a woody climber (*vrksavalli*) which have the shape of the tusk of a boar (*varahi, grsti*) or conical and curved like a pitcher (*carmakaraluko*) with abundant milky juice (*ksiravalli, ksirakanda, payasvini*). The drug is sweet (*svadukanda*), cooling in action, restorative, aphrodisiac, galactagogue, tonic, diuretic and demulcent. It promotes strength and complexion, improves voice, promotes breast milk and semen, overcomes vitiated *pitta* and *vata* and cures burning sensation. The drug is recommended in all cases of general debility and rheumatism. The important preparations using the drug are *Vidaryadi ghrtam, Dasamularistam, Cyavanaprasam*, etc.

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Adenosuma indiana

(Family: Scrophulariaceae)

Botanical Description

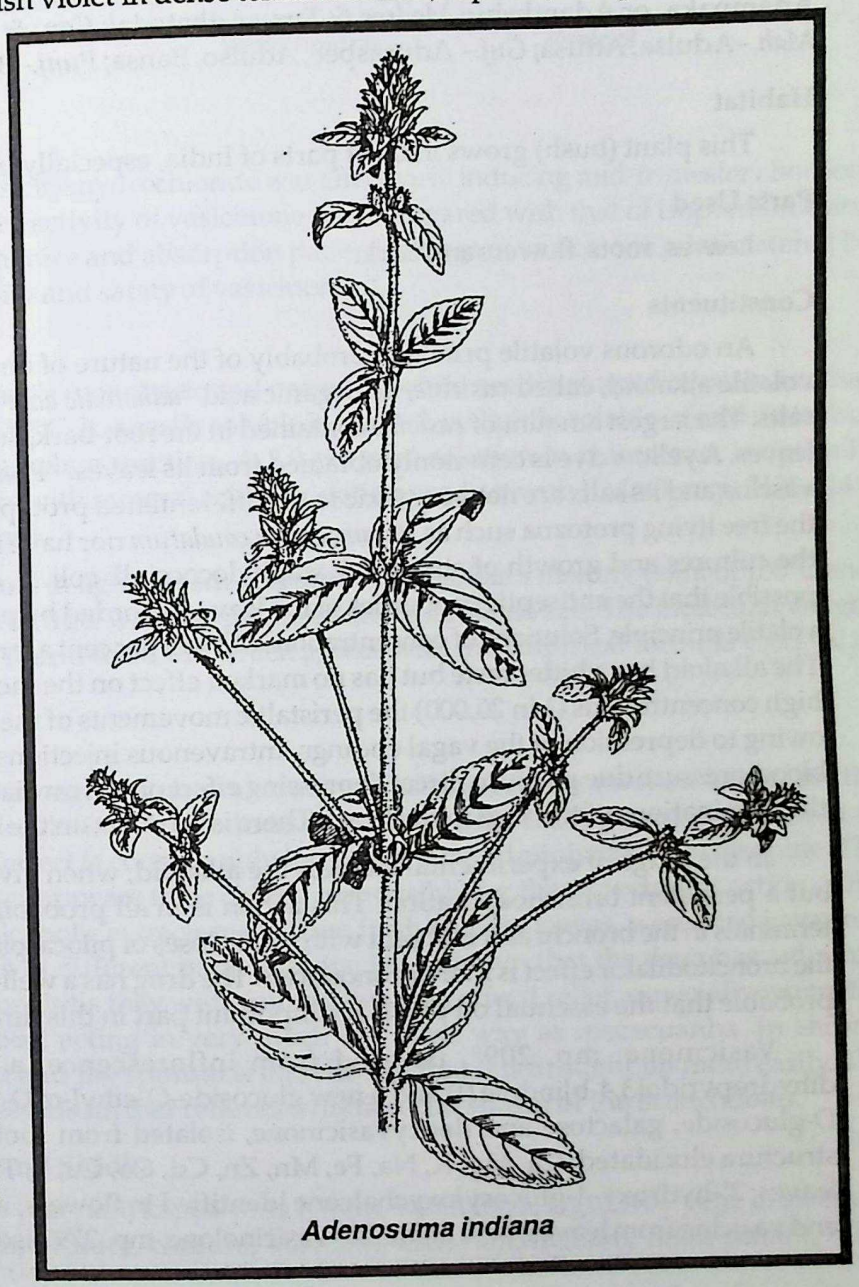
Erect villous herb; leaves simple, opposite or whorled, ovate to ovate-oblong, coarsely crenate, upto 5 × 2.5 cms; flowers small, bluish violet in dense terminal heads; sepals 5, unequal, lanceolate, hairy; outside corolla gamopetalous, bilabiate; stamens 4, filaments hairy at base ovary 2-celled, many ovuled; capsule ovoid; seeds scabrous.

Habitat

A common weed in open grass lands and in upland cultivations. It is found in W. Coast, W. Ghats, S. Canara to Travancore in rice fields.

Uses

This is one the eighteen drugs that constitute the *Surasadi gana* of Vagbhata. *Sprkka* is reported to be cooling, aromatic, bitter and aphrodisiac. It cures all the three *dosas*, itching, leprosy, poison, thirst, indigestion, fever and haematological, disorders. Infusion of the plant is useful in affections of the stomach and bowels. Juice of leaves is administered in cases of infantile catarrh, cough, colic, dyspepsia, and fever caused by teething. Decoction of the plant is an excellent fomentation for rheumatic joints. Roots form an ingredient of formulations like *Surasadi tailam, Pathadi gulika, Nirgundyadi ghrtam, Nirgundyadi gulika*, etc.



Adenosuma indiana

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Adhatoda vasica
(Family: Acanthaceae)

Vernacular Names

Sans.–Sinhaparni, Vasaka, Arusak, Vansa, Vrisha Sinhamukhi, Adarushah; *Eng.*–Malabar nut; *Hind.*–Adosa, Arusha, Rus, Bansa; *Ben.*–Adulsa, Bakas; *Pers.*–Bansa; *Duk.*–Adarsa; *Tel.*–Addasaram, Adampaka, or Adamkabu; *Madras & Tam.*–Adhatodai; *Can. & Kon.*–Adusogae; *Mal.*–Ataloetakam; *Mah.*–Adulsa, Adusa; *Guj.*– Aduraspee, Adulso, Bansa; *Punj.*–Bhekkar.

Habitat

This plant (bush) grows in most parts of India, especially in the lower Himalayan ranges.

Parts Used

Leaves, roots, flowers and bark.

Constituents

An odorous volatile principle probably of the nature of an essential oil; fat, resin, a bitter non-volatile alkaloid, called *vasicine*, an organic acid "*adhatodic acid*", sugar, gum, colouring matter, and salts. The largest amount of *vasicine* contained in the root-bark, and to the extent of 0.25 per cent in the leaves. A yellow dye is commonly obtained from its leaves. "Pharmacology of Vasicine: The alkaloid vascine and its salts are not very toxic to undifferentiated protoplasm. They have little or no effect on the free living protozoa such as *Paramaecium caudatum* nor have they any toxic or inhibitory effect on the cultures and growth of streptocci, staphylococci, B. coli, B. diphtherioe, or B. tuberculosis. It is possible that the antiseptic properties of the leaves recorded by previous observers may be due to the volatile principle. Solutions of concentrations of 1 to 5 per cent are not irritant to the mucous membrane. The alkaloid has a bitter taste but has no marked effect on the movements of the alimentary canal. In high concentrations (1 in 20,000) the peristaltic movements of the isolated gut are inhibited, probably owing to depression of the vagal endings. Intravenous injections in animals, produce a slight fall, of blood pressure due partly to direct depressing effect on the cardiac muscle and partly to depression of the terminations of the vagi in the heart. There is no effect on the blood vessels.

In the lungs of experimental animals the alkaloid, when given intravenously produces a slight but a persistent bronchodilatation. This action is in all probability due to depression of the vagal terminals in the bronchi as it is absent with small doses of pilocarpine. After administration of atropine, the bronchodilator effect is more pronounced. The drug has a well-marked expectorant action and it is probable that the essential oil plays an important part in this direction.

Vasicinone, mp. 209°, isolated from inflorescence; a new alkaloid-9-acetamido-3,4-dihydropyrido[3,4-b]indole (I) and a new glucoside-O-ethyl-α-D-galactoside-along with sitosterol-β-D-glucoside, galactose and deoxyvasicinone, isolated from roots; vasicol isolated from roots and structure elucidated; Ca, Mg, K, Na, Fe, Mn, Zn, Cd, Co, Cu, V, Ti, Mo and Ce contents estimated in leaves; 2'-hydroxy-4-glucosyloxychalcone identified in flowers; method for extraction of vasicinone and vasicine from leaves; new alkaloid - vasicinolone, mp. 279°-isolated from roots and characterised.

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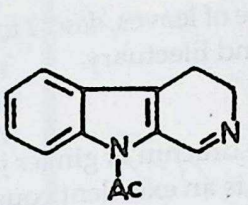
New Compounds



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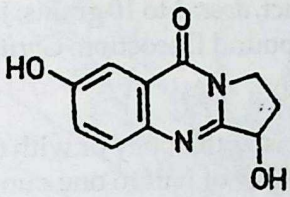
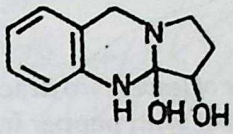


Vasicinolone



Vasicol

Biological Activity

Intraamniotic injection of vasicine hydrochloride was effective in inducing mid-trimester abortions at dose of 60 mg; bronchodilatory activity of vasicinone was compared with that of isoprenaline and aminophylline. Acute toxicity in mice and absorption pattern in dogs of vasicinone administered by different routes confirmed activity and safety of vasicinone.

Properties

The base visicine or vasicine, is monobasic and occurs as white needle-shaped crystals and has a melting point of 190°-191°; or 182°C. It is easily soluble in alcohol, is slightly soluble in cold water but more so in hot water with an alkaline reaction. A 2.0 per cent solution in chloroform is optically inactive. It forms crystalline salts with mineral acids; oxidation product with $KMnO_4$ m.p. 213°-214°. Vasicine behaves as a tertiary base.

Visicine hydrochloride occurs in light, cream-coloured crystals, has a melting point of 180°C and is very soluble in water. Visicinetartrate was also prepared and is a soluble salt. The molecular weight of viscine was determined and found to be 188 which agrees with the empirical formula $C_{11}H_{12}N_2O$ found by analysis.

Action

Expectorant, diuretic, antispasmodic and alterative. Vasicine has no marked action on the alimentary canal or on the circulation. It produces slight but persistent broncho-dilatation in experimental animals and this effect is considerably increased after administration of atropine. The essential oil present in the leaves appears to be chiefly responsible for the expectorant action of the drug. Clinically, tinctures and alcoholic extracts made from fresh and dry leaves, were tried in various civil hospitals and dispensaries in different parts of India, have shown that the drug has a definite expectorant action. In acute bronchitis they were found always to afford relief, especially where the sputum was thick and tenacious, acting in very much the same way as ipecacuanha. In chronic bronchitis the cough is relieved and the sputum is liquefied so that it is brought up more easily. The depression of the vagal terminations further relieves irritation and spasm of the bronchiloles.

Action and Uses in Ayurveda and Siddha

Tikta kasaya rasam, seetha veeryam, kapha-pitta haram, vatakaram, lagu, swaryam; in swasam, kasam, lagu; in swasam kasam, jwaram, chardhi, kushtam, kshayam, meham, rakta-pittam, rakta pradaram.

Action and Uses in Unani

Hot 2°, Dry 2°, cough, asthma, loosens balgham for easy expectoration.

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Preparations (Infusion) (1 in 10)

Dose: ½ to 2 ozs; Aqueous extract, *dose*: 4 to 10 grains; Juice of leaves, *dose*: 2 to 4 drachms; Tincture (1 in 10), *dose*: ½ to 1 drachm; Compound Decoction, *Ghrita* and Electuary.

Uses

Fresh *juice of leaves* two drachms with honey or with one drachm of ginger juice, or a *decoction of the leaves and root* with pepper in doses of half to one ounce, is an excellent cough mixture useful in chronic bronchitis, asthma and phthisis. In consumption, it relieves the irritable cough by its soothing action on the nerves, and by liquefying the sputum whim makes expectoration easier. Juice of the leaves is considered, in Northern India, useful for diarrhoea and dysentery, especially in haemoptysis and in the bleeding of dysentery. In Burma and in Northern India, the leaves are applied locally in the form of a poultice on rheumatic joints, inflammatory swellings and in neuralgias. Strong decoction is an efficacious fomentation to rheumatic and painful swellings and neuralgias; it is also a good application for scabies and other skin complaints. Dried leaves in powdered form are given in doses of 30 grains, in malarial fevers. Both the decoction and powder form constituents of many Ayurvedic preparations for affections of the respiratory tract. The medicine was considered so serviceable in phthisis that it was said, no man suffering from this disease need despair as long as Vasaka plant exists. Dried leaves are smoked as cigarettes with much benefit in asthma. Fresh *flowers* are bound over the eyes in ophthalmia.

Sarangdara describes the following compound decoction of the root of Adhatoda vasica, much used in fever with cough: Take of *vasaka* root, *gulancha* and the root of Solarium jacquini in equal parts, two tolas in all, and prepare a decoction in the usual way. This is given with the addition of honey. A *ghrita* is prepared with clarified butter, a decoction of the plant and a paste of the root taken in the usual proportion, and is used in phthisis. *Vasavaleha* or electuary of *Vasaka* is prepared thus: Take of the juice of *Vasaka* leaves foot seers, white sugar one seer, long pepper 16 tolas, clarified butter 16 tolas; boil them together till reduced to the consistence of an extract. When cool add honey one seer and stir with a ladle till intimately mixed. Dose is one to two tolas in phthisis, cough with pain in the sides, haemoptysis and asthma (*Bhavaprakash*). *Bhaishajyaratnavali* contains description of an oil "Vasachandanadi taila" which is prepared with a large number of valuable drugs, and useful for rubbing on the body in affections of the chest, especially in phthisis and also in epilepsy, hysteria, insanity and in scurvy.

Adhatoda zeylanica medicus

(Family: Acanthaceae)

Botanical Description

Profusely branched, evergreen shrub, branchlets grey-pubescent, leaves simple, opposite, short-petioled, elliptic-lanceolate acuminate, entire, prominently veined, upto 20 × 8 cms, dark green above, paler beneath; flowers white and axillary, bracteate spikes; bracts large, deccussate, leafy, ovate; calyx deeply 5 lobed, lobes lanceolate, equal, corolla bilabiate, white, tube short, throat villous stamens 2, attached at the throat of the tube, exserted; filaments villous below, and oblong, 2-celled; ovary 4-ovuled, stigma minutely 2-fid; capsule clavate, below, compressed; seeds orbicular, compressed.

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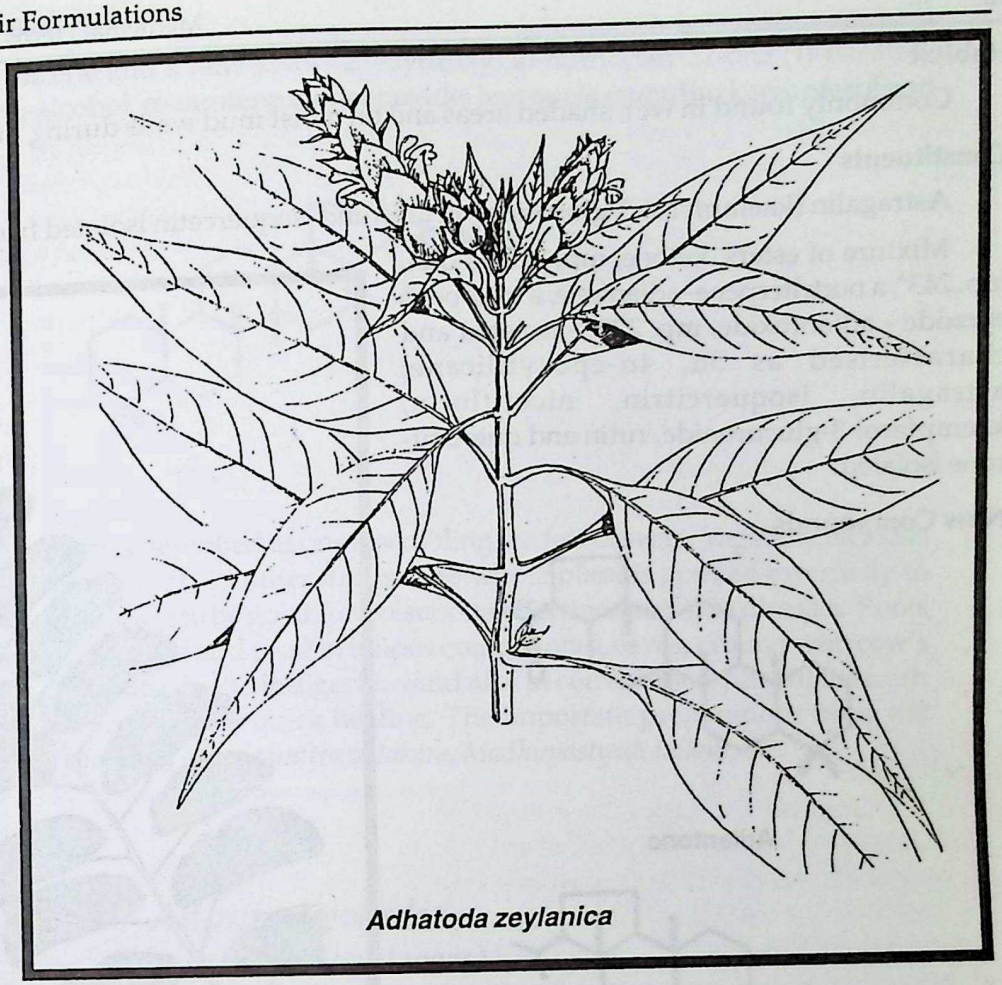
Habitat

The plant runs wild in most parts of India and is also frequently cultivated as a hedge plant. Distributed also in subtropical Himalaya, Indo-China and Malaya.



Adhatoda zeylanica

Vasa has been a reputed remedy for cough, bronchitis, asthma and other respiratory disorders due to its expectorant action. The juice of the leaves relieves cough by its soothening action on the nerves and by liquefying the sputum which makes expectoration easier. It is reported to be bitter, astringent, antispasmodic and alterative and cures vomiting, thirst, fever, dermatosis, jaundice, phthisis, haematemesis and diseases due to the morbidity of *kapha* and *pitta*. The leaf juice is especially used in anaemia and haemorrhage, in traditional medicine. Flowers and leaves are considered efficacious against rheumatic, painful swellings and form a good application to scabies and other skin complaints. The drug forms an ingredient of preparations like *Vasaristam, Valiya rasnadi kasayam, Chyavanaprasam, Gulgulutiktakam ghrtam*, etc.

Adiantum philippense, A. lunulatum Burm. f.

(Family: Polypodiaceae)

Botanical Description

A small, rhizomatous herb; rhizome covered with persistent leaf bases and scales; fronds simple pinnate, stipe glabrous, black, to 18 cm long; pinnae 10-15, stalked, ovate to lunate, minutely 5-8 lobed on the upper margin, each lobe bearing a transversely elongated sorus when fertile.

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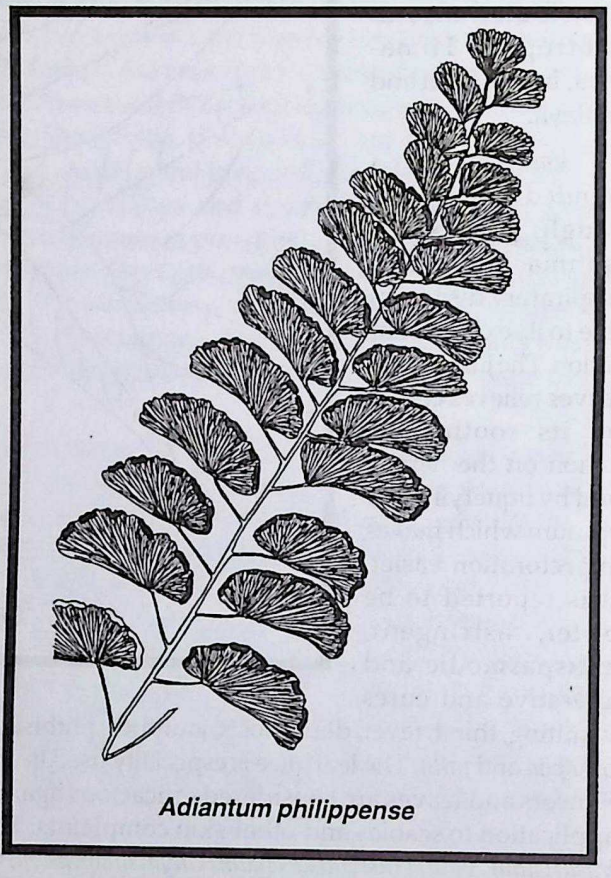
Habitat

Commonly found in wet, shaded areas and on moist mud walls during monsoon.

Constituents

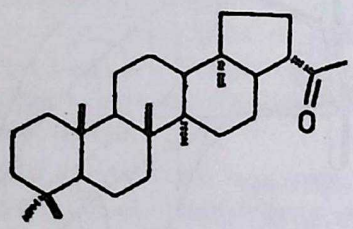
Astragalin (kaempferol-3-glucoside), prunin and isoquercetin isolated from plant.

Mixture of esters, ketone, mp. 222°, a diol, mp. 243°; a nortriterpene–adiantone; a triterpene epoxide - adiantoxide, mp. 229° - isolated and characterised as 3α, 4α-epoxyfilicane; astragalin, isoquercitrin, nicotiflorin, kaempferol-3-glucuronide, rutin and querciturone isolated.

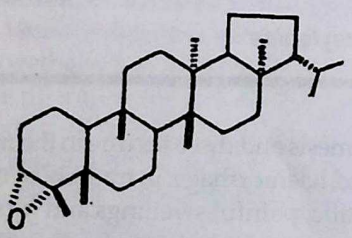


Adiantum philippense

New Compounds



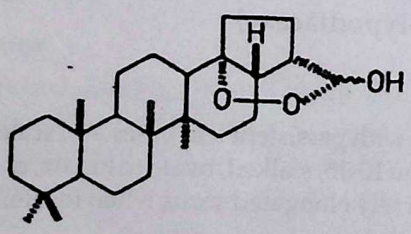
Adiantone



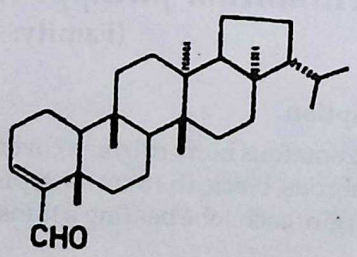
Adiantoxide

Isofernene (8-fernene), mp. 191°, fernene, mp. 171°, 7-fernene, mp. 211°, 3-filicene, mp. 224°, adiantone, mp. 220°, a nortriterpenoid hemiketal - adipedatol, mp. 185° - and filicenal from leaves.

New Compounds



Adipedatol



Filicenal

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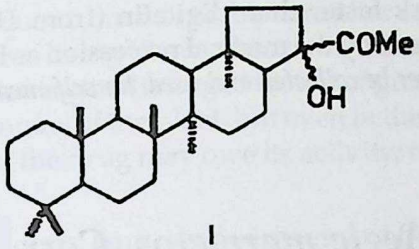
Adiantone, traces of 3-filicene and a new ketol - 21-hydroxy-30-norhopan-22-one (I)-isolated; along with a triterpenoid keto-alcohol, α-carotene monoepoxide, leucopelargonidin, kaempferol and quercetin glucosides.

New Compounds



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Uses

As the name indicates, the plant is described as one resembling the feet of swan. Vagbhata includes this drug in his *Vidaryadi gana* along with 19 other drugs. The whole plant is applied externally to burns with great effect. It is also reported to be good for poisonous affections and skin diseases. Roots are considered carminative, tonic, diuretic and used in bilious complaints. Leaves, ground with cow's milk, are given to children for diarrhoea due to indigestion and also in convulsions. Juice of the fresh plant is applied to abscesses and wounds for quick healing. The important preparations using the drug are *Vidaryadi ghrtam, Vidaryasavam, Manasamitra vatakam, Madhuyastyadi tailam*, etc.

Adonis vernalis

(Family: Ranunculaceae)

Botanical Description

A perennial herb with a stout, dark rhizome, which bears an erect, glabrous stem with sessile, finely divided (two or three time pinnate) feathery leaves and a large, terminal, solitary, shiny, golden-yellow flower. There may be up to 20 elliptic petals. This species flowers in early spring and the blossoms open fully only on sunny days. The fruit is an achene. *All parts of the plants are extremely poisonous.*

Habitat

Yellow Pheasant's Eye grows wild on lime-rich soils in southeastern and central Europe, Asia and America. In many countries it has been over collected and it is now a protected species. It is not native to the British Isles, but is occasionally grown in gardens. The related annual species–Summer Pheasant's Eye (*A. aestivalis*), Autumn Pheasant's Eye (*A. autumnalis*) and Pheasant's Eye (*A. annua*)–are also poisonous. *A. annua* is the only one of the three species that grows wild in Britain; it is a rare, naturalized weed of cornfields in a few southern countries of English and sometimes in Scotland. All these plants are named under Adonis, a beautiful youth loves by Venus. According to a Green legend, Venus transformed him into this flower after he had been killed by a wild boar. The species are also called pheasant's eyes because the flowers of some of them have a striking dark centre.

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Uses

In ancient times Yellow Pheasant's Eye was used to treat venereal diseases and later heart disorders. On the Continent the dried flowering stems, without the hard bottom parts, are still used medicinally. The most important constituents are the cardiac glycosides called cardenolides. These substances stimulate the heart, but they work faster than digitalin (from *Digitalis* leaves) and they do not accumulate in the body. They are used by the medical profession as heart stimulants and as sedatives. *No species of pheasant's eye should ever be collected and used for self-medication.*

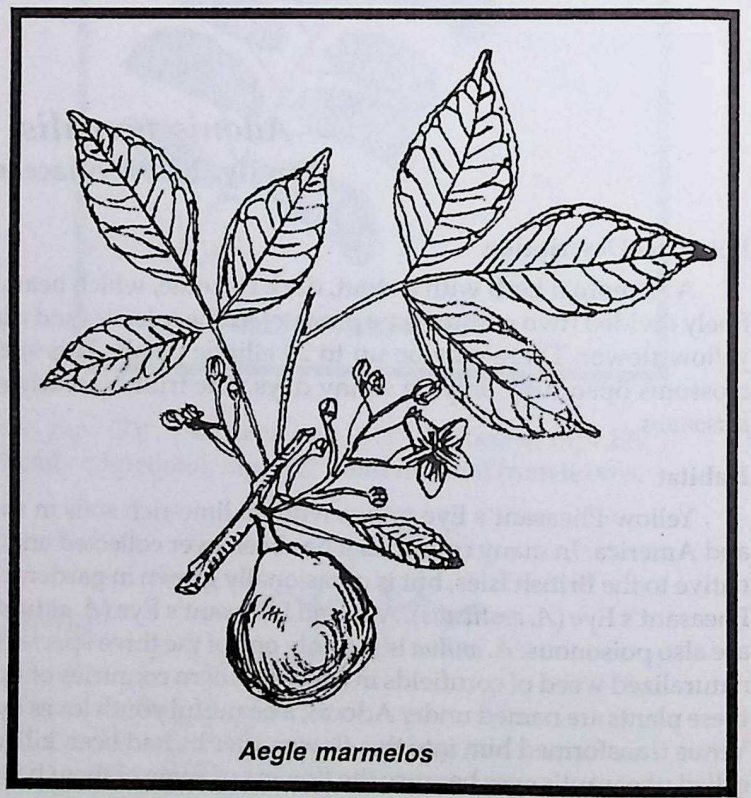
Aegle marmelos, Corr.
(Family: Rutaceae)

Vernacular Names

Sans.–Bilva, Bilvam, Sriphal (Sri.–Goddess of Abundance, Phal.–Fruit. It is an emblem of riches or fertility); *Eng.*–Bael fruit, Bengal quince; *Hind.*–Bel, Bael Sripal; *Guj.*–Bilivaphal, Bilinuphal; *Bom.*–Bael; *Mah.*–Baela; *Tel.*–Bilvamu, Bilvapandu, Maredu; *Tam.*–Vilvam, Vilva-pazham, Bilvam; *Can.*–Belapatre; *Mal.*–Koovalam, Vilvam; *Ben.*–Bela, Bael; *Sind.*–Katori; Gond.–Maika; *Pers.*–Shul.

Habitat

Found all over India, from sub-Himalayan forests, Bengal, Central and South India, and in Burma. Two kinds of fruit are available in the market–a small and wild variety and a large cultivated variety. (The full-grown fruit of either variety, when it just begins to ripen is best for medicinal purposes).



Aegle marmelos

Parts Used

Fruit (both ripe and unripe), root-bark, leaves, rind of the ripe fruit and flowers.

Constituents

The pulp contains mucilage, pectin, sugar, tannin (tannic acid), volatile oil, bitter principle, ash 2 per cent, and a balsamic principle resembling balsam of Peru. The wood-ash contains potassium and sodium compounds, phosphates of lime and iron, calcium carbonate,

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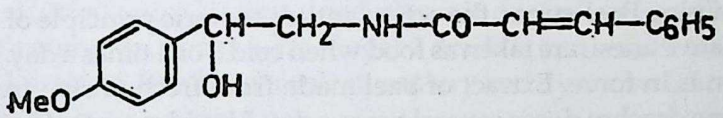
magnesium carbonate, silicia, sand etc. Fresh leaves yield in distillation a yellowish-green oil with a peculiar aromatic odour; Marmelosin. According to Fluckiger and Hanbury the dry pulp contains chiefly mucilage and probably pectin. The dried pulp was exhausted by Henry and Brown, with boiling alcohol, the extract concentrated in vacua and the thick syrup diluted with water to precipitate fatty and resinous matters. The liquor from this precipitate after concentration in vacua to remove all alcohol, was tested by them on a free living ciliate protozoan, Glaucoma. The solution was found to be marked by toxic to glaucoma but owing to the large amount of gum present it proved difficult to get a satisfactory preparation of the tannins of the plant, but even in the impure form these appeared to be fairly active. They concluded that the drug may owe its activity; to the tannins that are present since these are toxic to Glaucoma.

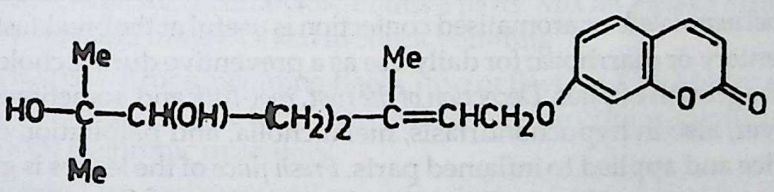
Dutt and Dixit extracted the roots, bark, seeds, leaves and fruits, with various solvents and the composition was determined in each case. The roots, leaves and bark were found to contain reducing sugars, and tannin mainly. The fruit pulp yielded, in addition to the usual substances, a body which has been named marelosin, which is considered to be one of the most important active principles of the fruit. The seeds, when crushed and extracted with petroleum ether, gave a light yellow oil which has been found to possess very good purgative properties when taken internally in doses of 1.5 gm.

Umbelliferone, skimmianine, a new coumarin-marmin, mp. 123°-β-sitosterol, lupeol and γ-sitosterol from immature bark and roots; γ-sitosterol from leaves; a phenolic alkaloid characterised as 1-phenyl-7-hydroxytetrahydroquinazolin-4-one from roots; aegeline, mp. 176°, identified as N-β-hydroxy-p-methoxyphenylethylcinnamide from leaves.

New Compounds



Aegeline



Marmin

Action

Ripe fruit is sweet, aromatic, cooling, alternative and nutritive. When taken fresh it possesses laxative properties. Unripe fruit is astringent, digestive and stomachic, and a little constipative. Pulp is stimulant, antipyretic and antiscorbutic. Fresh juice is bitter and pungent.

Action and Uses in Ayurveda and Siddha

Tender fruits: Tikta kashaya-rasam, ushna veeryam, vata kapha haram, pitta karam, grahi, ruksham, lagu, pachanam, balyam, improves agni. *Fruits*: Mathuram, guru. *Root*: Vata haram.

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Action and Uses in Unani

Hot 1°, Dry 2°, Tonic, brain, heart, stomach, astringent, haemostatic, dysentery, aphrosidiac.

Powder (of the dried pulp), *dose*: 10 to 40 grains. Syrup, *dose*: ½ to 1 oz. Decoction, Juice of bark and leaves. Extract of bael made from fresh unripe fruit.

Preparation

Powder (of the dried pulp), *dose*: 10 to 40 grains. Syrup, *dose*: ½ to 1 oz. Decoction, Juice of bark and leaves. Extract of bael made from fresh unripe fruit.

Uses

Fruit is very valuable in habitual constipation, chronic dysentery and dyspepsia. It is one of the ingredients in the *Dasamul* or ten roots used in Ayurveda. *Unripe or half ripe fruit*, owing to the presence of tannins or mucilagenous substances which act as demulcent, cut up in slices and sun-dried or roasted and made into a comfiture (conserve) or a powder, is prescribed in chronic diarrhoea and dysentery, with debility of the mucous membrane, intestinal conditions specially useful in chronic diarrhoea and dysentery of children where there is no fever. Dried pulp of the *fresh ripe fruit* is made into a pleasant orange-coloured morning *sherbat* by mixing with sugar and cream or with curds, two ounces of the pulp in three or four ounces of water or syrup, by straining all these through a piece of muslin to remove seeds and mucilage. "Bael-water" prepared as follows acts as a specific in dysenteric-diarrhoea: An unripe Bael fruit is taken (in which the starch is on the point of being converted into sugar); it is cracked in two or three places and roasted when the inside of the fruit is a little softened by the heat and the starch is further converted into sugar. This is mixed with hot water to which a little fried and pulverised Anesi (Foeniculum vulgare) is added and the whole mixture is strained so that the starch-water containing Bael-sugar, the active anti-dysenteric principle of Bael fruit and the fine particles of the carminative anesi, are taken as food when cold 3 or 4 times a day. No other food is given when this prescription is in force. Extract of bael made from fresh unripe fruit is also given in the alternative, in half to one drachm doses several times a day. Liquid extract of bael prepared from dried slices of unripe fruit is also prescribed in doses of one to two drachms. The *sherbat* has mild astringent properties, is laxative and is a good simple cure for dyspepsia. *Bael fruit* is eaten during convalescence after diarrhoea. *Bael marmalade* or aromatised confection is useful at the breakfast during convalescence from chronic dysentery or diarrhoea; for daily use as a preventive during cholera epidemics. It is also given to prevent the growth of piles. *Decoction of the root, root-bark* and sometimes the *stem-bark* is useful in intermittent fever, also in hypochondriasis, melancholia, and palpitation of the heart. *Leaves* are made into a poultice and applied to inflamed parts. *Fresh juice* of the leaves is given with the addition of black-pepper in anasarca with constiveness and jaundice, and when diluted with water or honey it is a highly praised remedy in catarrh and feverishness; it is largely used in Bengal as antibilious and febrifuge. The astringent *rind* of the ripe fruit is employed by *Kavirajas* in acute dysentery and its usefulness is enhanced by the combination of opium. *Powder* of the dried pulp, kept in airtight bottles, is given in doses of ½ to 1 drachm, with treacle in recent dysentery with griping pain in the loins and costiveness. Dose as tonic is from I2 to 15 grains of the powdered pulp; as a febrifuge and antiscorbutic it is from 16 to 20 grains and as nauseant and antidysenteric it is from 20 grains to 2 drachms. Powder is more useful in acute diseases and the syrup in the chronic. The beneficial effects of the bael fruit, are however, most evident when the condition in amoebic dysentery has become subacute or chronic. After its administration in these conditions, the blood gradually disappears and the stools assume a more foeculent and solid form. If bael is continued for sometime, the mucus is also decreased and may disappear. It is very useful in patients suffering from chronic dysenteric condition characterised by

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alternate diarrhoea and constipation. Claims have also been made that it relieves flatulent colic in patients suffering from a condition of chronic gastro-intestinal catarrh. In the after-treatment of bacillary dysentery, bael is a useful adjuvant. According to Action and Knowles the chief trouble with such patients, as a rule, is constipation which if not relieved does not allow the ulcerated surfaces to heal firmly. Bael sherbet is a useful addition to the dietary at this stage and acts chiefly as a demulcent.

In cases of sprue also, the bael fruit has been spoken of highly by Manson-Bahr. In many patients, especially those in the pre-sprue or early stages of the disease, it is undoubtedly helpful. The fresh fruit is best taken raw mixed with sugar, though dried fruit has also been recommended. For a child the following is an excellent prescription in cases of chronic diarrhoea: Powder of unripe fruit six grains, compound powder of kino one grain and pure white sugar in fine powder one gain; mix together; this dose is to be given two or three times a day. Pulp of the fresh fruit mixed with milk and administered with cubeb powder acts as diuretic and astringent on the mucous membranes of the generative organs; therefore useful in chronic gonorrhoea. The small unripe fruit is given with fennel seeds and ginger in decoction for piles. Two tolas of the juice of the *bark* is given with a little cumin in milk as a remedy for poverty of the seminal fluid. The following are some useful household formulas:

1. Take of Beal fruit 1, Holarrhena antidysenterica 2, Indian sweet fennel seeds 1, chebulic myrobalan 1 and Sugar 3 parts. Mix, reduce the whole to a powder, then add Plantago, Ispaghula. *Dose*: One to three drachms. Useful subacute and chronic dysentery.
2. Take of Bael fruit 4 drs., Scindapsus officinalis 1 dr., Andropogon muricatus 1 dr., Symplocos racemosa 1 dr. Mix and reduce the whole to a fine powder. *Dose*: 20 to 30 grains. Useful in chronic diarrhoea and dysentery.
3. Take of Bael (dried pulp) 2½ drs., dried ginger ½ dr., Indian sweet fennel seeds 2½ drs., Silk cotton tree's gum 1 dr., honey 2 drs., Sugar 3 drs. Mix and reduce the whole to a fine powder. *Dose*: ½ to 1 drachm. Used in chronic dysentery and dysenteric diarrhoea of hot climates.
4. Bael pulp 1 dr., Catechu 1 dr., Pomegranate bark 1 dr. Mix and make a powder. *Dose*: ½ to 1 drachm. Used in dysentery and chronic diarrhoea.
5. Rind of the Bael fruit 5. Cocculus Cordifolius 4 parts. Mix and make a decoction in the usual way; when ready and honey. Given to check vomiting.
6. *Bilva Panchaka* (Five drugs including Bael): Take of Bael fruit 10. *Mocharasa* 10, Kernel (seed) of Mango 7. Nutmeg 2 and Opium 1 part. Mix and reduce the whole to a powder. *Dose*: 20 to 40 grains given in chronic dysentery.
7. *Bilva Rasayanam* 1 oz. and castor oil emulsion 1 oz. mixture, given 1 oz. every three hours, cured dysentery within three days. *Diet*: Thin butter-milk and fruit juice of Kamala oranges.

Aerva lanata (Linn.) *Achyranthes lanata* Linn.

(Family: Amaranthaceae)

Botanical Description

Much branched woody herb, pubescent when young, leaves simple, alternate, short petioled, ovate to orbicular, 2-3.5 × 1-2.5 cms. gradually smaller towards apices, base attenuate to cuneate, apex obtusely apicullate, glabrate or finely pubescent above, white wholly beneath; flowers minute, sessile,

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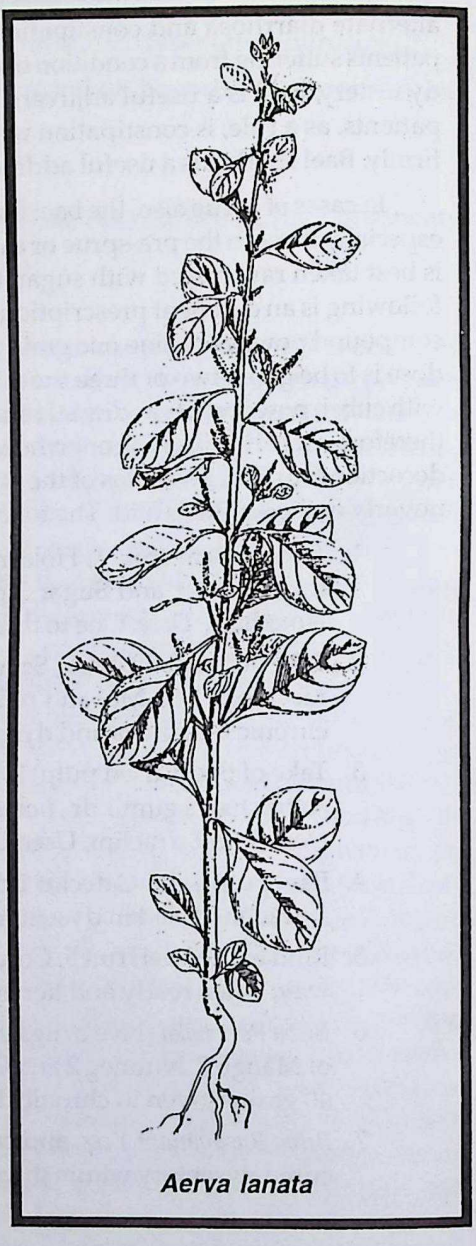
bisexual, greenish or hoary-white in axillary spicate clusters; bracts and bracteoles ovate, membraneous; perianth calycine, membraneous of five free keeled segments, covered outside with white woolly hairs; stamens 5, filaments connate at base with alternating linear staminodes, anthers 2-celled; ovary ovoid or subglobose unilocular with one ovule; fruit greenish, compressed, membraneous utricle or circumscissile capsule; seed reniform.



Aerva lanata

Habitat

A common weed found in all plains districts and upto 900 meters elevation.It is widespread in the drier parts of the tropics and subtropics of the Old World, Africa and Asia.

The pharmacological studies reveal that the roots of *Aerva lanata* possess diuretic anti-inflammatory, anthelmintic, antibacterial and mild analgesic effects.

Uses

This is one of the ten auspicious herbs that constitute the group *Dasapuspam* (*i.e.* ten flowers), the members of which are believed to curb the incentive for sinful acts, destroy the causative factors of all unhealthy features and bestow good health and prosperity. *Bhadra* is cooling, diuretic, lithontripric and is used in haemetemesis, diabetes and lithiasis. It helps to arrest haemorrhage associated with pregnancy. The roots are demulcent and are used in the treatment of headache and strangury. This whole herb is medicinal, though the roots are often preferred.

Aesculus hippocastanum, Linn.
(Family: Sapindaceae)

Botanical Description

A tall, deciduous tree with grey-brown, scaly bark and spreading branches. The large, sticky, brown buds open into large palmate leaves with five to seven leaflets. The flowers are yellowish white and are clustered in dense, erect panicles. The fruit is a green, spiny capsule with one or two nut-like shiny brown seeds– the well-known horse chestnuts or 'conkers'. Children have been poisoned, though not fatally, after eating the green outer casing of the fruit and they should be warned about this.

Habitat

Horse Chestnut is native to south-eastern Europe and seems to have been introduced into England around 1550. The tree's generic name, *Aesculus*, comes from the Latin word *esca* (= food). The name was

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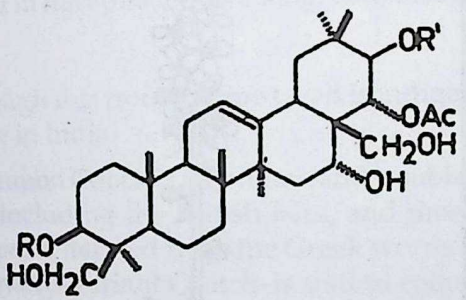
given originally to a type of oak, the acorns of which were ground to make a flour. How it came to be transferred to Horse Chestnut is not known. There is also confusion about the origin of the tree's specific and common names. *Hippocastanum* is a Latin translation of Horse Chestnut, and this name could be derived from a Turkish custom of feeding chestnuts to horses ailing from respiratory diseases. At one time the plant was used to treat malaria.

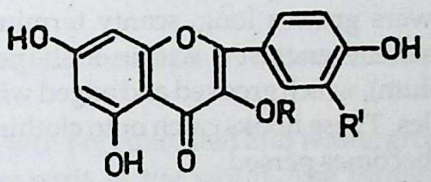
Constituents

Escin, mp. 224°, from seeds; quercetin-3-xylosidoglucoside, mp. 198°, kaempferol-3-diglycoside, mp. 203°, quercetin-3-glucosidorhamnoside, mp. 206°, kaempferol-3-xylosidoglucoside, mp. 189°, kaempferol-3-glucosidorhamnoside, mp. 186°, quercetin-3-glucoside, mp. 177° and quercetin-3-diglucoside, mp. 205°; quercetin-3,4-diglucoside from seeds; new glycosides–kaempferol-3-α-L-arabinofuranoside, mp. 228°, kaempferol-3-α-L-rhamnofuranoside, mp. 173°; avicularin and quercetin-3-α-L-rhamnofuranoside, mp. 177°, isolated and their structures elucidated; castaprenol-11, castaprenol-12 and castaprenol-13 from leaves; enzymatic hydrolysis of pure saponin yielded mixture of genins whose main constituent identified as protoaescigenin-21-tiglate-22-acetate; escin found to be mixture of α- and β-escins which on hydrolysis gave glucuronic acid, glucose (1:2) and protoaescigenin-22-acetate acylated by either angelic or tiglic acid at C-21; O-β-D-fructofuranosyl-(2→6)-β-D-fructofuranosyl-α-D- glucopyranoside, mp.143°, from seeds.

New Compounds



Escin
R = Gluc. Acid (2→1) Glu (4→1) Glu
R' = Tigloyl/Angeloyl



Kaempferol 3α-L-arabinofuranoside
R = Ara, R' = H
Quercetin-3α-L-rhamnofuranoside
R = Rha, R' = OH

Biological Activity

The MLD of escin in frogs (lymph node), mice, rats (subcutaneous) and rabbits (i.v.) was 1.0, 0.5, 0.75, and 0.02 g/kg respectively. In subtoxic doses it accelerated respiration, acted as hypotensive and cardiac stimulant. Escin caused inhibition of oedema and reduction of vascular fragility in anaphylactoid ovalbumin edema and in the petechial reaction of rats; i.v. and oral LD50 in rat (mg/kg) of saponin was 16.8 and 50 respectively; permeability of skin capillaries as determined by the trypan blue method, was not influenced significantly by proaescigenin; escin, however, showed a striking effect.

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Uses

The fully ripe chestnuts, sometimes the bark, are used medicinally. The constituents include up to 28 per cent of saponins (of which aescin is the most important), the coumarin glycosides aesculin, aesculoside and fraxin, and tannins. Horse Chestnut has astringent, antipyretic and antithrombic properties. In some countries it is included in proprietary medicines used to treat cardiovascular diseases. It is also used for varicose veins, respiratory infections and severe diarrhoea. A tincture of fresh chestnuts is used in homeopathy. *All internal use of Horse Chestnut should be medically supervised.* Externally Horse Chestnut is used to treat cuts and grazes, frostbite, ringworm and haemorrhoids. A coumarin component (aesculoside) is included in some sun-screen preparations.

Agrimonia eupatoria

(Family: Rosaceae)

Botanical Description

A perennial herb with a short rhizome are erect, hairy, usually unbranched stem. The basal leaves are arranged in a row and they and the alternate sessile leaves are pinnate, serrate and hairy. The small, star-shaped yellow flowers grow a long, scanty terminal spike. The is an achene enclosed within a shaped receptacle (hypanthium), which grooved and edged with a ring of hook bristles. These hooks catch onto clothing and the seeds thus becomes persed.

Habitat

Agrimony is a common and widespread, grassland plant throughout Europe, including most of the British Isles; it is in north Scotland. It occurs in field margins, woodland clearings, on hedgeba and road verges. The generic name *Agrimonia*, may come from the Greek *agremone*, a word given to plants the supposedly, healed cataracts, of the. The specific name, *eupatoria*, proba refers to Mithradates Eupator, King Pontus, who resisted the Roman inclusions into Asia Minor in the first century BC and who introduced many her remedies. Agrimony was used in the days to treat catarrh, bleeding, skin diseases, tuberculosis, even as a charm ward-off snakes. It is still a popular medicinal plant.

Agrimonia eupatoria

Uses

The flowering stems and leaves are used medicinally. The dried herb has a pleasant, slightly bitter smell and taste and the constituents include tannins,

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silicic bitter compounds, an essential oil a vitamins. It has astringent, carminative and anti-inflammatory properties and used primarily to treat gastritis and teritis. It also stimulates gastric secretion and alleviates liver, bladder and kidney disorders, especially kidney stones. In herbal medicine it is usually administer in the form of a decoction. External Agrimony is used as a gargle for so throat, in compresses for skin rashes at the cuts, and in bath preparations. All parts of the plant yield a good yellow dye.

Agropyron repens
(Family: Gramineae)

Vernacular Names

Latin.–Agopyrum, Triticum; *Eng.*–Couch grass, Quitch, I'witch; *Fr.*–Rhizome de Chiendent; *Ger.*–Queckenwuezel.

Botanical Description

A perennial grass with a long, white, jointed, creeping rhizome bearing both sterile and fertile hollow, jointed stems (culms). The linear leaves have sheaths that encircle the culms. The flowers are arranged in flat spikelets in a long, stiff, loose terminal spike. The fruit is a one-seeded grain.

Habitat

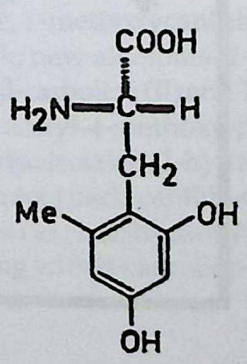
Though this troublesome weed is indigenous to Europe and is introduced into America, is now available in India.

Common Couch is a common and troublesome weed of cultivated and waste, ground throughout Europe including the British Isles, and most other parts of the world. The former generic name, *Agropyron*, is derived from the Greek words *agros* (= field) and *pyros* (= wheat, grain). The common name–and its variant Quitch–is said to come from the Anglo-Saxon word *cwice* (perhaps meaning quick) on account of the plant's fast spreading habit. Common Couch has long been–and is still–used as a harmless remedy for urinary ailments. The roasted herb was once used as a substitute for coffee and as a raw material for making beer and spirits.

Constituents

A new amino acid–orcylalanine–identified as 2,4-dihydroxy-6-methylphenylalanine from seeds; orcylalanine distributed throughout the plant.

New Compounds



Orcylalanine

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Uses

The rhizome are used medicinally. When dry they have a pleasant aroma and sweetish taste. The constituents include saponins, sugars (triticin, inositol and mannitol), the phenolic glycoside avenein, mucilage and the hydrocarbon agropyrene, which has an antiseptic action. The plant is mildly diuretic and herbalists include it in tea mixtures to treat disorders of the bladder and urinary tract, uroliths and kidney inflammations. Common Couch is also recommended for gout and rheumatism.

Ailantus excelsa, Roxb.

(Family: Simarubeae)

Vernacular Names

Sans.–Madala aralu, Mahanimba, Atarusha; *Hind.*–Mahanimb; *Ben. and Duk.*–Maharukha; *Mah.*–Mahanimb, Adusa; *Uriya.*–Mahanim, Mahala; *Tel.*–Peddamanu; *Tam.*–Perumaruttu; *Can.*–Doddamani or hiremara; *Guj.*–Adusa, Motho-araduso; *Mal.*–Perumaram.

Habitat

Common in many parts of India, U.P., Bihar, Mumbai, Western Peninsula, Carnatic, Coromandal Coast.

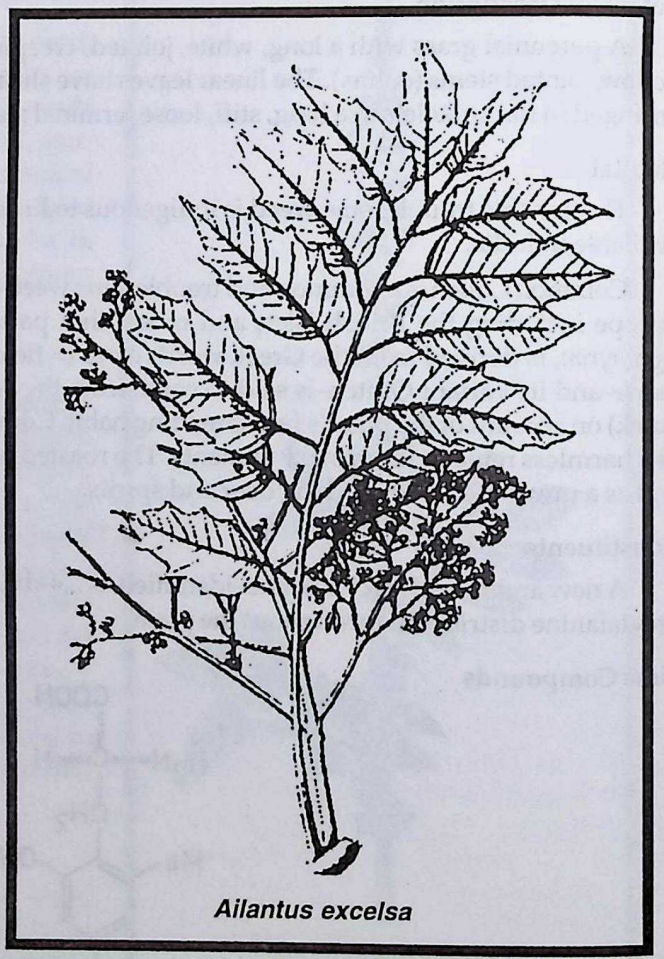
Parts Used

Bark and Leaves.

Constituents

Bark contains an important bitter principle, known as *Ailantic Acid*. It is waxlike, reddish-brown, easily soluble in alcohol, water, ether etc. It is related to *Quassin*, probably indentical with *Codrin* and *Samaderin* obtained from other members of this species.

Three bitters–2,6-dimethoxyquinone, ailantone, mp. 222° and an unidentified compound, mp. 263°–isolated; four compounds–chaparrinone, mp. 238°, ailanthone, mp. 234°, and two substance, mp. 155° and 259°–from seeds; fatty acids (27%) from bark appear to be C22 acids; bitter substances I, mp. 253° and II, mp. 264°, from bark.



Ailantus excelsa

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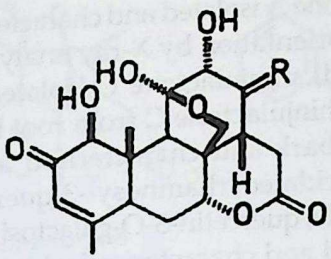
New Compounds

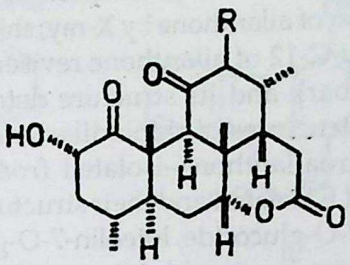


Ailanthone

R=CH_2

Chaparrinone

R = α-Me,H



I

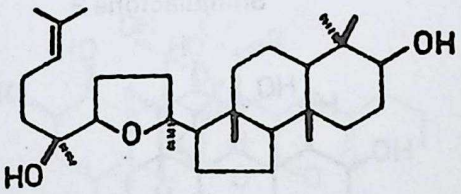
R = CH

II

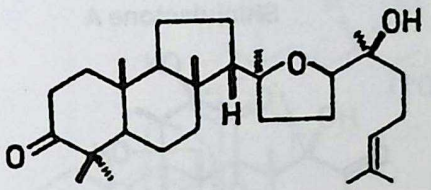
R = β-OAc

New triterpenoids–malabaricol, mp. 68°, epoxymalabaricol, mp. 143°, and malabaricanediol–isolated from trunk exudate.

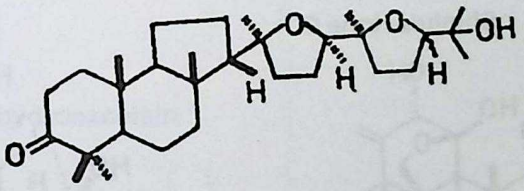
New Compounds



Malabaricanediol



Malabaricol



Epoxymalabaricol

Indole alkaloids–canthin-6-one, 1-methoxycanthin-6-one and methyl 6-methoxy-β-carboline-1-carboxylate–isolated from root bark; new alkaloids–1-(2′-hydroxyethyl)-4-methoxy-β-carboline (I), 1-(1′,2′-dihydroxyethyl)-4-methoxy-β-carboline (II) and 1-methoxycanthin-6-one-3N-oxide (III)–isolated from root bark and characterised; 1-acetyl-4-methoxy-β-carboline, canthin-6-one, 1-methoxy-canthin-6-one and canthin-6-one-3N-oxide also isolated; 1-hydroxycanthin-6-one and 1-(1′,2-dihydroxyethyl)-4-methoxy-β-carboline isolated from root bark; canthin-6-one, 1-methoxycanthin-6-one and 4-methoxy-1-vinyl-β-carboline isolated from leaves; 1-(2-hydroxy-1-methoxy)-ethyl-4-methoxy-β-carboline and 5-hydroxymethylcanthin-6-one along with β-carboline-1-propionic acid, 1-carbamoyl-β-carboline and 1-carbomethoxy-β-carboline isolated.

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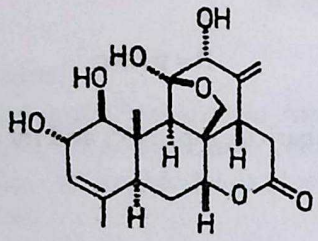
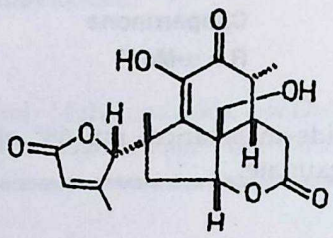
New bitter quassinoid–shinjudilactone–isolated from root bark and its structure elucidated; structure confirmation of ailanthone by X-ray; shinjulactone A isolated and characterised; configuration of hydroxyl group at C-12 of ailanthone revised to α-orientation by X-ray analysis; shinjulactone B isolated from stem bark and its structure determined; shinjulactone C isolated and its structure elaborated; crystal structures of shinjudilactone and shinjulactone C from root bark determined; a quassinoid–2-dihydroailanthone–isolated from root bark and characterised as shinjulactone A; shinjulactones D and E isolated and their structures elucidated; rhamnosyl-3-quercetin isolated from leaves; apigenin, its 7-O-glucoside, luteolin-7-O-glucoside, quercetin-3-O-galactoside, kaempferol and quercetin isolated from leaves; shinjulactone F isolated and characterised; shinjulactones G and H isolated and their structures elucidated.

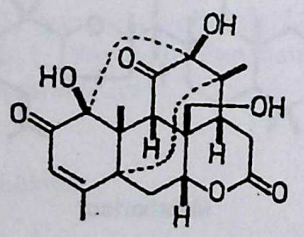
New Compounds



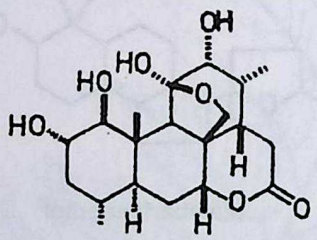
Shinjulactone A



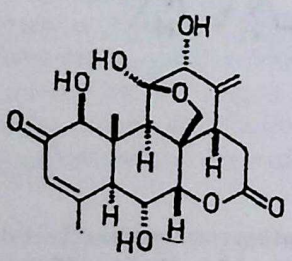
Shinjulactone B



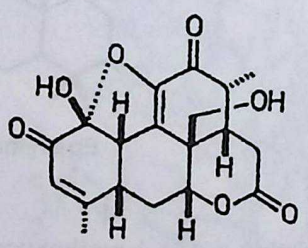
Shinjulactone C



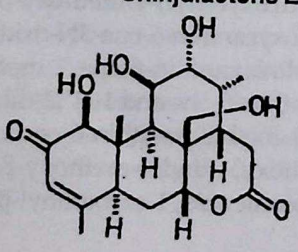
Shinjulactone D



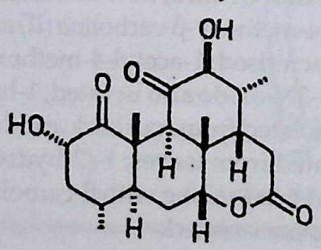
Shinjulactone E



Shinjulactone F



Shinjulactone G



Shinjulactone H

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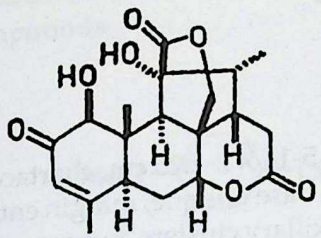
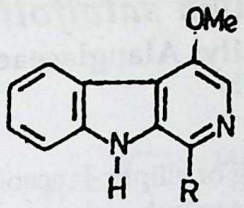


Shinjulactone

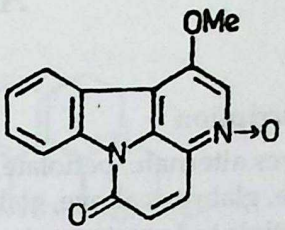


I

R = CH_2CH_2OH

II

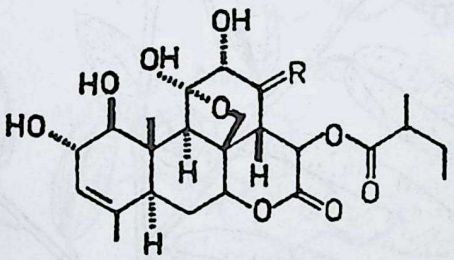
R = $CH(OH)CH_2OH$



II

Excelsin and 13(18)-dehydroexcelsin isolated from bark and characterised; glaucarubol also isolated; a new triterpene-3S,24S,25-trihydroxytirucall-7-ene (I)–isolated; 1:12-deoxyl-13-formyl-ailanthinol and -β-sitosterol isolated and characterised from bark.

New Compounds

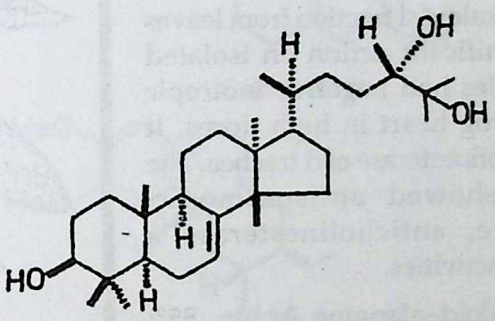


Excelsin

R = α-Me,H

13(18)-Dehydroexcelsin

R = CH_2



I

Absolute configuration of malabaricol 13(18)-dehydroexcelsin isolated from bark.

Action

Bitter tonic, carminative and febrifuge. Bark is expectorant and antispasmodic.

Preparation

Infusion of the bark, (1 in 20), *dose*: 1 to 2 ounces. Ailantic Acid, *dose*: 1 to 3 grains; in large doses it causes nausea, vomiting and purging.

Uses

Bark and the *leaves* in infusion are reputed as tonic in debility after child-birth; especially–useful in dyspepsia, bronchitis and asthma. *Juice* of leaves is usually administered in *Khir* or the juice of the fresh bark is given with coconut milk and treacle or with aromatics and honey, it is said to stop after-pains. The bark is a good substitute for *Kuda* bark. *Ailantic Acid* is given as tonic and alterative in dyspepsia with constipation.

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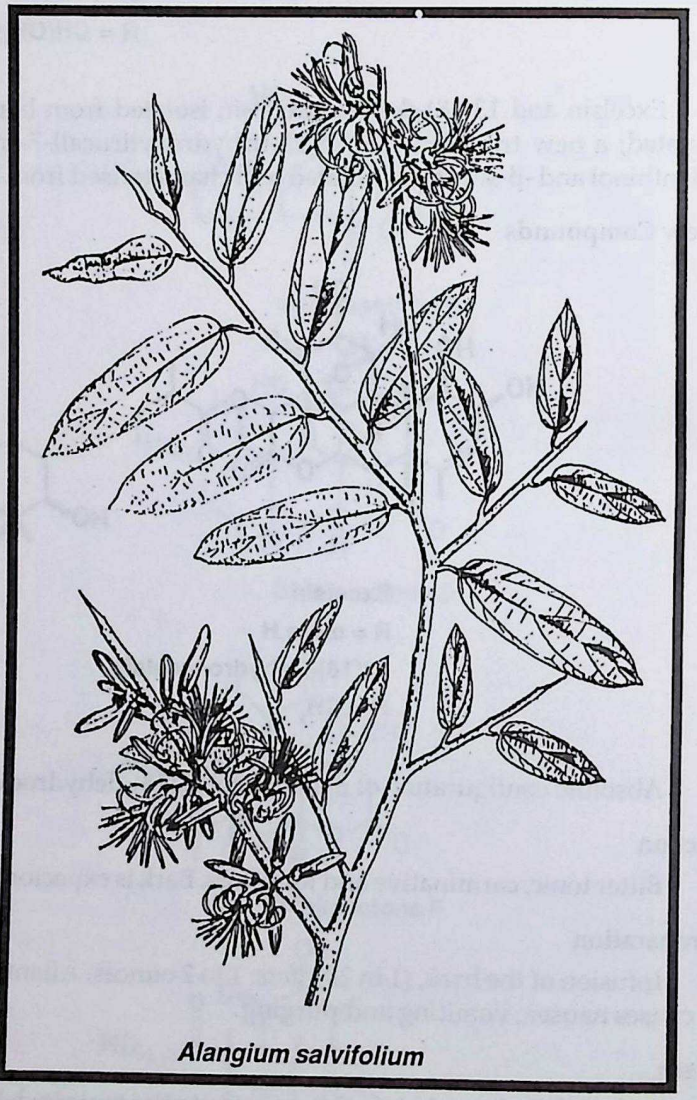
Alangium salvifolium
(Family: Alangiaceae)

Botanical Description

Tree; leaves alternate, petiolate, oblong or elliptic-lanceolate, 5-14 × 2-2.25 cm, chartaceous, 3-5 nerved at base, glabrous above, glabrescent or puberulous below, base oblique, margin entire, apex acuminate, petiole to 1 cm, tomentose; flowers white, scented, in axillary clusters, pubescent outside; calyx tube cupular, adnate to the ovary, tomentose; petals 10, linearly oblong, reflexed; stamens 20, filaments villous at base, subconnate, anthers linear; ovary turbinate, 1-celled, stigma capitate; fruits ovoid, 2-2.5 cm long, rusty tomentose.

Habitat

The plant is distributed in dry regions, in the plains and lower hills in India and also in Africa, Sri Lanka, Indochina and China.



Alangium salvifolium

Constituents

Total alkaloidal fraction from leaves had no significant action on isolated rectal muscles had negative inotropic action on frog heart in high doses. It inhibited cholinesterase of d trachea. The alkaloids showed antispasmodic, hypotensive, anticholinesterase a adrenolytic activities.

An alkaloid–alangine A, mp. 85°; two new alkaloid marckine and marckidine–from root bark; tubulosine, mp. 257°, cephaeline, mp. 102°, from root bark; emetine, cephaeline and psychotrine, mp. 121°, from stem and root bark; in addition to tubulosine a new C-3′ stereoisomer–isotubulosine, mp. 198°–isolated from roots; lamarckinine, mp. 265°, from bark; N-methylcephaeline and deoxytubulosine from barks of root and stem; psychotrine, alangicine and demethylpsychotrine from root bark; a new phenolic alkaloid–ankorine, mp. 174°; campester episterol and two unidentified triterpenoids; deoxytubulosine alangimarckine, mp. 184°, and ankorine from leaves; choli chloride isolated from leaves; betulinic acid, betulin aldehyde, betulin, lupeol and β-sitosterol from the see; a new phenolic alkaloid–alangamide, mp. 213°.

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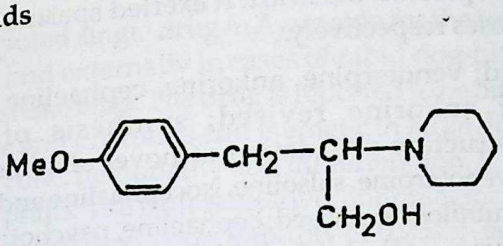
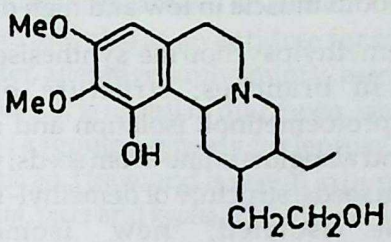
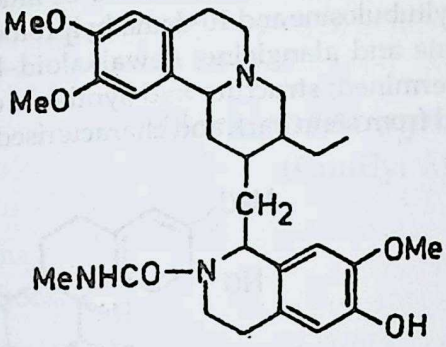
New Compounds



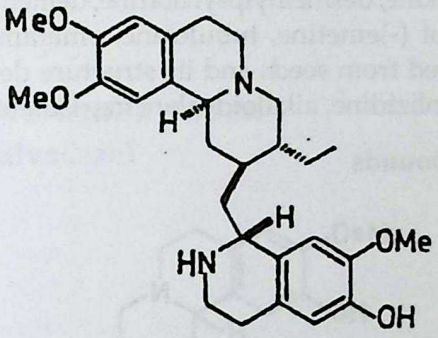
Alangine



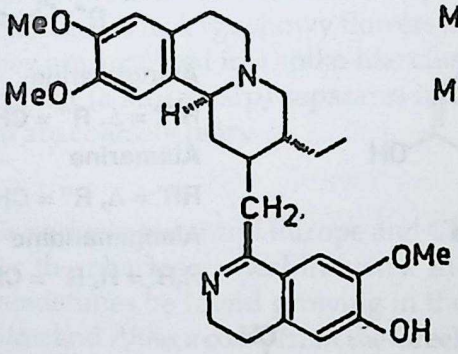
Ankorine



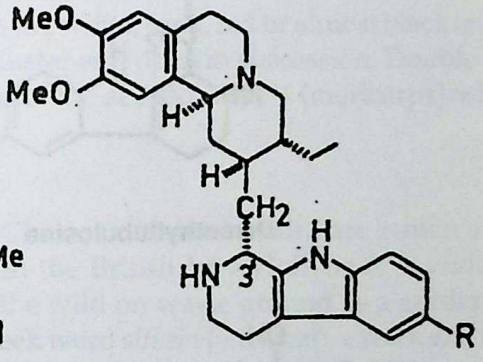
Alangamide



Cephaeline



Dimethylphychotrine



Tubulosine
R = OH
Isotubulosine (3'epimer)
R = OH
Deoxytubulosine
R = H

Biological Activity

An amorphous yellow alkaloid (AL60) from stem bark showed biphasic action on blood pressure of intact cats. At low dose it caused a brief temporary decrease in blood pressure followed by a permanent and prolonged increase. With high doses (0.4-1.6 mg/kg) considerably greater decrease occurred. In contrast, spinal cats showed only a brief high pressure with improvement in the cardio-dynamic activity independent of dosage; in intact cats, AL60 in low dose induced a positive inotropic

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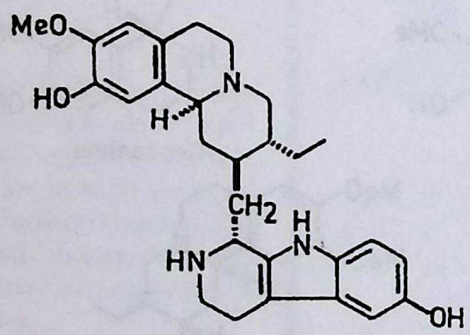
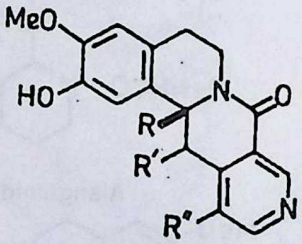
effect cardiac muscle but in higher dose it depressed the heart. It exerted spasmodic and spasmoly effects in smooth muscle in low and high doses respectively.

(+)9-Demethylpsychotrine synthesised; venoterpine, ankorine, cephaeline and psychotrine identified in branches; structure of ankorine revised; synthesis of ankorine and 11-methoxyprotoemetinol; isolation and structure elucidation of novel alkaloids–alangimarine, alamarine and alangimaridine–from seeds; venoterpine, salsoline, isocephaeline and deoxytubulosine isolated from seeds; structure of demethyl- tubulosine revised; cephaeline, psychotrine, ankorine and venoterpine isolated; new isomeric alkaloids–10-demethylprotoemetinol and 9-demethylprotoemetinol–isolated from seeds; stereospecific syntheses of ankorine, alangicine, alangimarckine, desmethylpsychotrine, demethyltubulosine and 10-demethylprotoemetinol reviewed; synthesis of (-)emetine, tubulosine, emetamine and alangicine; newalkaloid–bharatamine, mp, 132°–isolated from seeds and its structure determined; structure and synthesis of alangicine; new benzoquinolizidine, alkaloid–alancine–isolated from stem bark and characterised.

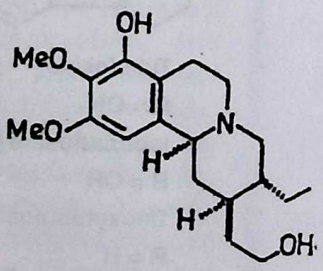
New Compounds



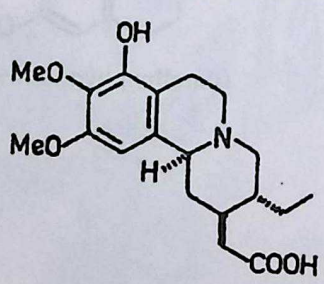
Demethyltubulosine



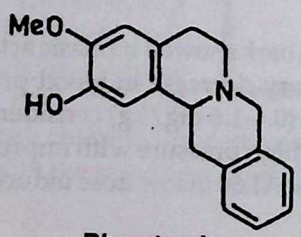
Alangimarine
RR' = Δ, R" = CH = CH_2
Alamarine
RR' = Δ, R" = CH(Me)OH
Alangimaridine
R,R' = H, R" = CH = CH_2



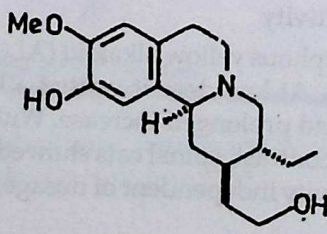
Ankorine



Alancine



Bharatamine



10-Demethylprotoemetinol

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Uses

This is a reputed single drug in Ayurveda for the treatment of rabies. The root bark is administered both internally and externally in cases of rabid dog-bites and also as an antidote for other poisonous bites including snake bites. The drug is reported to be bitter, alterative, anthelmintic, astringent, laxative easily digestible and unctuous and is emetic in large doses. It is useful in diarrhoea, simple continued fevers, worms, colic, hemopathy and inflammation. It is a reputed remedy for leprosy and other skin diseases and syphilis. The fruit is laxative, antiphlegmatic and tonic and is useful in burning sensation, emaciation, haemorrhages and morbidity of *tridosas–vata, pitta* and *kapha*. The drug is an ingredient of *Mahabhutaravaghrtam*.

Alcea rosea syn. Althaea rosea

(Family: Malvaceae)

Vernacular Name

Eng.–Hollyhock.

Botanical Description

A biennial or perennial herb with tall, erect, leafy stems. The leaves are alternate and palmate with blunt, dentate lobes. The large showy flowers are white, pink, red or almost black and grow from the leaf axils. They are arranged in a spike-like cluster and open in succession. Double forms occur. The disc-shaped fruit (a schizocarp) separates into one-seeded nutlets (mericarps) when ripe. All parts of the plant are coarsely hairy.

Habitat

Hollyhock is natively to central Europe and China. Cultivated strains are grown in the Balkans as field crops for the pharmaceutical industry. In the British Isles Hollyhock is widely grown in gardens; it can sometimes be found growing in the wild on waste ground as a garden escape. The generic names *Alcea* and *Althaea* come from the Greek word *althein* (= to heal), a reference to the healing properties of this and related species of mallow, among them Marshmallow (*Althaea officinalis*) and Common Mallow (*Malva sylvestris*). The actions of Hollyhock and Marshmallow are very similar and both plants have a long history of medicinal use. The derivation of the common name, Hollyhock, is obscure. It is an old name and probably comes from 'holy' plus the Anglo-Saxon word *hoc* for mallow.

Uses

The flowers of dark, sometimes also double, forms are used medicinally. All parts of the plant must be free of mallow rust (*Puccinia malvacearum*). The constituents include abundant mucilage, the pigment anthocyanin and tannins. Hollyhock has excellent emollient and demulcent properties, which make it a useful treatment for inflammation of the mucous membranes, cough, asthma, chronic gastritis and enteritis, and for constipation. In herbalism it is usually administered in the form of an infusion. Hollyhock is also used in soothing herbal compresses and in bath preparations for skin disorders and cuts and bruises. The fresh leaves have similar beneficial effects. The dark pigment is used to colour medicines and foodstuffs.

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Alchemilla xanthochlora
(Family: Rosaceae)

Vernacular Name

Eng.–Lady's mantle.

Botanical Description

A perennial herb with a short rhizome bearing ascending or sprawling stems and a rosette of basal leaves that have dentate lobes and are circular or reniform in outline. The small, greenish-yellow flowers are arranged in dense clusters in a compound terminal cyme. The sepals are in two rings of four; there are no petals. The fruit is an achene. All parts of the plant are softly hairy.

Habitat

Alchemilla xanthochlora occurs throughout Europe in meadows, pastures and woodland clearings. It grows all over the British Isles in lowland areas, but is less common in southeastern England and southern Ireland. It is one of an aggregate of species, collectively called *Alchemilla vulgaris* and Lady's Mantle, which differ in small ways but all have the same medicinal properties. The aggregate species is often cultivated. The drops of dew or rain water that collect in the centre of the leaves were used by medieval alchemists who believed them to have medicinal and magical powers. The plant's generic name *Alchemilla* (from the Arabic word *alkimiya*), derives from this custom. Traditionally Lady's Mantle has been used for healing wounds and curing women's ailments and it was long ago dedicated to the Virgin Mary, the lobes of the leaves being supposed to resemble the edges of a mantle.

Uses

The flowering stems, including the basal leaves, are used medicinally. The constituents include tannins, essential oils, saponins, bitter compounds and salicylic, acid. Lady's Mantle is mildly astringent, diuretic and anti-inflammatory and herbalists prescribe it for digestive disorders such as gastritis and enteritis, flatulence and diarrhoea. It also relaxes muscular spasms and regulates the menstrual cycle, particularly during the menopause. Externally Lady's Mantle is used in bath preparations for wounds, bruises and skin disorders, and it is a valuable herbal cosmetic.

Allium cepa
(Family: Liliaceae)

Vernacular Names

Sans.–Palandu, Durgandha; *Eng.*–Onion; *Hind. & Pers.*–Piyaz; Bea.–Piyaj, Piyang, Pyaj, Pulantic; Guj. & *Sind.*–Dungari-kando; *Sind.*–Basar; *Mah.*–Kanda; *Can.*–Neerulli; *Tam.*–Vengayam, Ullegaddi, Irulli; *Mal.*–Eerulli, Bawang; *Tel.*–Yerragadda, Neermulli; *Burm.*–Kyet-th-woni-ni, Kesun-ni; *Assam.*–Piyas; *Sind.*–Lunu; *Arab.*–Basl.

Botanical Description

A perennial herb with an edible brown, scaly bulb bearing hollow, tubular leaves and an erect stem that is thickened at the base and terminated by an umbel of greenish-white flowers. The fruit is a

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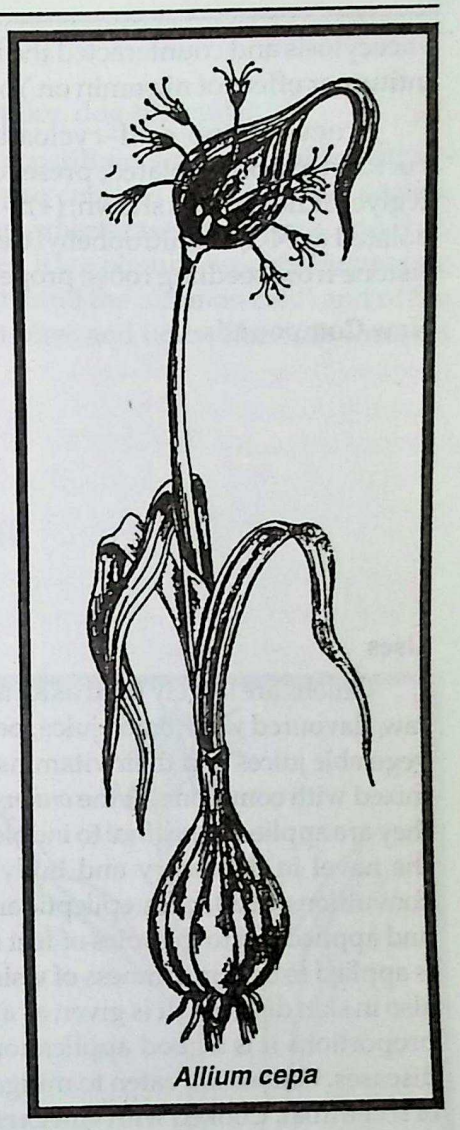
capsule with black seeds. Onion is almost odourless when intact, but if cut it produces a distinctive smell and releases a tear-producing substance. The stronger the smell the stronger the healing constituents.


Allium cepa

Habitat

Cultivated all over India.

Parts Used

Bulb and seed.

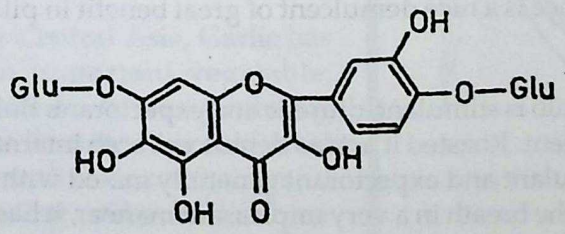
It is believed that Onion originally grew wild in Asia but no wild form of the plant as we know it today survives. Even several thousand years ago Onion was being cultivated as a vegetable and medicinal plant in Mesopotamia, India and Egypt. It was probably introduced to Europe by the Romans. Nowadays Onion is one of the commonest vegetables and is cultivated in many forms and varieties. The colour of the bulb may be whitish. brownish, purplish or red depending on the variety and the size of the bulb. The generic name, *Allium* is the Latin for Garlic (*A. sativum*) a related species. The name Onion seems to be derived from the Latin word *unio* (= one large pearl).

Constituents

Bulbs contain an acrid volatile oil which contains sulphur; essential oil and organic sulphides; outer skins of the bulb contain a yellow colouring matter Quercetin. Fresh red onions contain 85.60 moisture; and the completely dried material contains ether extract 2.17 p.c., Albuminoids 11.62 p.c. (containing 1.86 p.c.), soluble carbohydrates 78.53 p.c., woody fibre 4.02 p.c., and Ash 3.66 p.c. (contg. 0.635 p.c.) respectively. Onions also contain a considerable amount of sugar.

Quercitol, its 3,4′-diglucoside and 7,4′-diglucoside (I) isolated from bulbs and characterised.

New Compounds



I

Total extractive has potent and prolonged hypoglycaemic effect in artificially-induced diabetes in rats and rabbits; i.p. administration of purified water-soluble extract to rabbit caused marked

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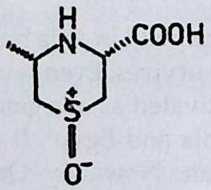
leucocytosis and counteracted the leucopenic side–effect of antitumor agent, nitromin, but accelerated antitumor effect of nitromin on Yoshida sarcoma. LD50 in mice 2.5 g/kg.

A new amino acid–cycloallin–isolated; two trisaccharides–1-β-fructosylsucrose and 6-β-fructosylsucrose–isolated; presence of oleanolic acid (0.1%) and arabinose, rhamnose, xylose, ribose in glycosidic fraction shown; (+)S- methyl-L-cysteine sulfoxide and (+)S-propyl-L-cysteine sulfoxide isolated as N-2,4-dinitrophenyl derivatives from bulb; carbohydrates from green leaf, bulb and root; histone from seedling roots; propenyl sulfenic acid from bulbs.

New Compounds



Cycloallin

Uses

Onions are largely used as an article of food and condiment. Onions can advantageously be eaten raw, flavoured with lemon juice, pepper, salt etc., to enable the body get the maximum amount of the vegetable juices and their vitamins. *Bulbs* are useful in fever, dropsy, catarrh and chronic bronchitis; mixed with common salt the *onions* are a domestic remedy in colic and scurvy. Roasted or otherwise they are applied as *poultice* to indolent boils, bruises, wounds, etc. to relieve heat sensation; applied to the navel in dysentery and bodyheat; juice is used like smelling salts in faintness, in infantile convulsions, headaches, epileptic and hysterical fits; it is dropped warm into the ear to relieve earache; and applied hot to the soles of feet as a derivative in convulsive disorders; it is sniffed in epistaxis; it is applied to eyes in dimness of vision and locally to allay irritation of insect bites, scorpion stings and also in skin diseases. It is given as an antidote in tobacco-poisoning. Mixed with mustard oil in equal proportions it is a good application to rheumatic pains, other inflammatory swellings, and in skin diseases. Onions are eaten to mitigate cough in phthisis; mixed with vinegar they are useful in cases of sorethroat. Cooked with vinegar they are given in jaundice, splenic enlargement, and dyspepsia. In malarial fevers they are eaten twice a day with two or three black peppers with remarkable relief. Onions eaten with jaggery stimulate growth of children. A decoction of the onions is found to benefit much the cases of strangury and extreme heaty sensation; and roasted onions mixed with cumin, sugar-candy and cow's ghee is a nice demulcent of great benefit in piles.

Action

Oil contained in the bulb is stimulant, diuretic and expectorant. Bulb is emmenagogue; externally it is stimulant and rubefacient. Roasted it acts as demulcent both internally and externally. Juice of the onion is aphrodisiac, stimulant and expectorant generally mixed with honey, ginger-juice and ghee. Though raw onion scents the breath in a very unpleasant manner, it has an especially antiseptic value throughout the entire alimentary canal, better than when roasted or cooked. Eaten raw it is also, diuretic and emmenagogue.

Action and Uses in Ayurveda and Siddha

Mathura rasam, Kapha karam, Vata karam, as for *vellai poondu*.

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Action and Uses in Unani

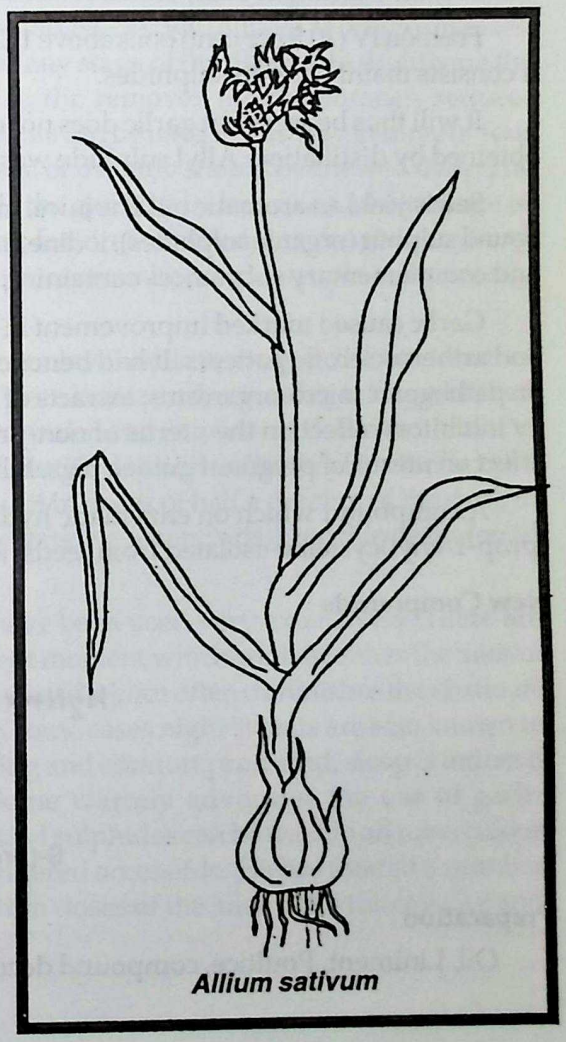
Hot 2°, Dry 1°, Stomachic, munzij, aphrodisiac, diuretic, jaundice, dog-bite, piles.

The fresh bulb is used medicinally. The most important constituents are organic sulphur-containing compounds, which are excellent antiseptics. Onion also contains essential oils, sugars, vitamins and minerals. Besides its germicidal action, Onion has expectorant, diuretic, stomachic, choleretic, anthelmintic, hypotensive and hypoglycaemic properties. It is a popular remedy for treating infections of the respiratory passages (especially coughs, bronchitis and the common cold) and of the digestive system. Crushed fresh Onion can be applied to insect bites and boils. The bulb loses its effectiveness when dried.

Allium sativum, Linn.
(Family: Liliaceae)

Vernacular Names

Sans.–Lasuna, Ugragandha, Bhutagna, Mahusudha, Rasonam, Mlecha-gandha; *Eng.*–Garlic; Hind. & *Bom.*–Lasan; *Sind.*–Thum; *Pers.*–Sir; *Guj.*–Lasan, Shunam; *Mah.*–Lasun; *Tel.*–Velluli, Tellagadda; *Tam.*–Vellapundu, Vallaipundu, Ullipoondu; *Mal.*–Vellulli; *Can.*–Bellulli; *Ben.*–Rasun.


Allium sativum

Botanical Description

A perennial herb with a bulb divided into segments (cloves), basal linear leaves and an erect stem terminated by an umbel with numerous small bulbils between the purplish-white flowers. The flower cluster is enclosed by a sheath (spathe) of papery bracts. The fruit is a capsule with black seeds, but the seeds do not ripen in cultivated plants.

Habitat

Originally from India or Central Asia, Garlic has long been cultivated as an important vegetable, seasoning and medicinal herb. It was probably introduced into Britain by the Romans. It is cultivated commercially only on a very small scale in Britain; most supplies are imported. Breeding and selection have yielded countless varieties, which are propagated vegetatively by planting the cloves in rows in prepared soil. Garlic's name is derived from the Anglo-Saxon word *garleac*, from *gar* (= a spear) and *leac* (= a leek), supposedly meaning a leek with cloves like spearheads.

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Parts Used

Bulb and oil.

Constituents

An acrid volatile oil which is, the active principle, starch, mucilage, albumen, sugar etc: Volatile essential oil (0.25%) obtained by distilling the bruised bulbs contains allyl, propyl disulphide and other organic sulphides or sulphur compounds. It is a clear limpid liquid of dark-brown or yellow colour, of very repulsive and intense garlic odour and of repugnant taste. The yield is from 0.06 to 0.1 per cent. Its specific gravity at 14.5° is 1.0525 and it is optically inactive. When purified it is colourless and can be distilled without decomposition. With some samples, even at winter temperature, the oil becomes semi-solid through, the deposition of fine crystals. Semmler found that the oil decomposes when heated to 150°C. Fractionated under 16 mm. pressure, four different fractions were obtained:

Fraction I (6 per cent) consists of allyl propyl disulphide. It has the odour of onions and gives a voluminous precipitate with mercuric chloride.

Fraction II (60 per cent) consists of daillyl disulphide which has the odour of garlic. It is rendered colourless by distilling with a little potassium.

Fraction III (20 per cent) boils between 112° to 122°C at 16 mm. pressure.

Fraction IV (10.5 per cent) boils above 122° at 16 mm. pressure and decompses on further distillation. It consists mainly of polysulphides.

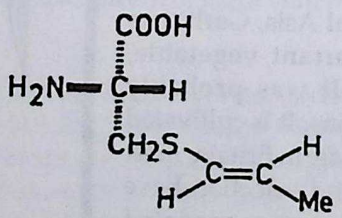
It will thus be seen that garlic does not contain any allyl sulphide in any of the different fractions obtained by distillation. Allyl sulphide was previously thought to be the chief constituent.

Seeds yield an aromatic oil. The juice, more particularly its oil constituents, are rich in organically bound sulphur (organic sulphides), iodine and salicic acid combinations, apart from important nutrient and complementary substances containing vitamins.

Garlic caused marked improvement in systolic and diastolic arterial tension in 114 hypertensive and artherosclerotic patients. It had beneficial prophylactic action. It had definite bactericidal effect on pathogenic micro-organisms; extracts of leaves; stems and bulb produced a stimulating, followed by inhibitory, effect on the uterus of non-pregnant guinea pigs; conversely, it produced stimulating effect on uterus of pregnant guinea pigs. It had slight effect on the intestine.

A compound which on enzymatic hydrolysis afforded glutamic acid and a new amino acid–S-(prop-1-enyl)cysteine–isolated from seeds; isolation of S-(prop-1-enyl)cysteine from seeds.

New Compounds



S-(prop-I-enyl)cysteine

Preparation

Oil, Liniment, Poultice, compound decoction and Powder.

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Action and Uses

Hot, stimulant, carminative, emmenagogue, antirheumatic, anthelmintic and alterative. Oil from the seeds is stimulant. The medical properties are due to the oil of which the doses is ½ to 2 minims. *Externally* the bulb is used as resolvent. Garlic act as vermifuge expelling round worms. Oil is a powerful antiseptic. Continuous ingestion of garlic juice imparts an objectionable odour to the breath and effluvium of the skin. But "Alliocaps" (oil maceration of finest garlic in capsules) of Dr. Madaus & Co., are free from odour and taste, and therefore, protracted use of "Alliocaps" reduces the unpleasant exhalation of the skin to a minimum. *Internally* garlic is beneficial in several forms of atonic dyspepsia. Succus allii has been administered in 10 to 30 minim doses in several cases of flatulence an colic, with good results. The essential oil of garlic is absorbed into the circulation and is excreted through the lungs and bronchial mucosa acting as a good antiseptic and antispasmodic. Some recommends garlic in the form of tinct. allii either alone or in combination with the usual expectorant mixtures. When there is much gastro-intestinal catarrh, garlic in the form of an ointment is rubbed on the abdomen, a binder being applied afterwards. It is said to be very effective in bronchial and asthmatic complaints. According to scientist garlic is a remedy for many diseased conditions. He considers it is a prophylactic for typhus, typhoid and diphtheria. He advises in the first two diseases the trial of 1 drachm of succus allii sativi, every four to six hours, given in beef tea or with syrup. For a child under twelve, ½ drachm in syrup is sufficient. Given early in typhoid fever it will almost abort the diseases, and its action as an intestinal antiseptic makes it valuable at any stage of the disease. In diphtheria the constant application obtained by chewing a 'clove' of garlic removes the membranes, reduces temperature and relieves the patient. About 1 to 2 ozs. of garlic can be used in this way in three or four hours. For a week after the membrane disappears, 1 or 2 ozs. of the bulb should be chewed daily. The diphtheritic patient has no taste or smell, and merely finds the garlic hot. Used in an inhaler three or four hours daily the succus rapidly relieves the distressing features of whooping cough. For young infants and children 20 to 30 minims of the succus in syrup every four hours gives rapid relief in early cases.

Some thinks that garlic, if given in sufficient doses, is an invaluable remedy in the treatment of pneumonia. He used it for 2 years in the treatment of lobar pneumonia and, according to his published report, in no instance has it failed to bring the temperature, pulse and respiration down to normal in about 48 hours. In no case was the crisis deferred beyond the 5th day of the disease. He chiefly used tinct. allii made from garlic bulbs (strength 1 in 5) and gave it in doses of half a drachm of the drug in water every four hours. The results in other bronchial infections, *e.g.*, bronchitis, bronchiectasis, foetid bronchitis and influenza, were no less promising.

In pulmonary phthisis, garlic and its preparations have been used very extensively. There are several proprietary preparations on the market at the present moment which contain either the juice of garlic or its constituents. In tubercular affections of the lungs, garlic juice often diminishes the obstinate cough and expectoration. The appetite is improved and in some cases night sweats are also known to subside completely. As a result of the sensation of well-being and comfort produced, sleep is induced and digestion improves resulting in gain in weight. Some warmly advocates the use of garlic preparations in tuberculous affections. According to him, allyl sulphides can be used in all tuberculous lesions in accessible situations or in those which can be rendered accessible. He has treated a number of cases of tuberculosis of the larynx in man by ½ to 1 drachm doses of the juice 2 to 3 times a day and has always obtained very good results.

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Action and Uses in Ayurveda and Siddha

All rasa except amla, root; katu; stem: kashayam, leaf: tikta; top: lavana; bulb: mathura. *Poondu*–Karu mathura rasam, katu vipaka, ushna veeryam, snigdham, brahmanam, vrishyam, pachanam, tikshnam, rasayanam, in swasa kasam, archas, kushtam, krimi, agnimandyam. *Juice*–T.B. Sinus.

Action and Uses in Unani

Hot 3°, Dry 3°, paralysis, forgetfulness, tremor, colicky pains; of the intestines, internal ulcers of the lungs, secretes semen, chronic fevers.

Further Uses

Clove of garlic (juice) was known as a home remedy in olden days in the East, and is one of the most useful on account of its prophylactic and curative properties. An Indian firm, prepares garlic oil capsules in a cold process without any chemical constituents but of a potence well calculated to protect the human body from the attacks of bacteria and bacillae in times of epidemics, or when the danger of infection is prevalent, and containing all the curative properties of the clove of garlic. These capsules renew the blood, cleanse it of all impurities, regulate the digestion and remove all parasites in the intestines which might be injurious to health, and are recommended for diseases of the lungs, arterio-sclerosis, high blood pressure, gout, rheumatism, asthma, chronic bronchial catarrh, intestinal complaints, loss of appetite, constipation and worms. Used extensively as a spice in India for chutnies, in seasoning vegetables and curries, and for flavouring pickles. The oil from seeds is prescribed internally as a febrifuge to prevent recurrence of the cold fits of intermittent fever; *externally* it is used in paralytic and rheumatic affections.

As resolvent the *garlic* is applied to indolent tumours; *internally* it is given with common salt in affections of the nervous system, headache, flatulence, hysteria, coughs etc. It is applied like onions to the nose in cases of fainting. In the form of confection it is given in rheumatism. *Externally* the juice used as a rubefacient liniment acts very beneficially in infantile convulsions, other nervous and spasmodic affections, relaxed sore throat, in asthma, general paralysis, facial paralysis, gout, sciatica, and in skin diseases including leprosy. Bruised garlic and onions are applied to the chest as *poultice.* When eaten in cold season it is said to ward off attacks of rheumatism and neuralgia. Mustard or coconut oil in which garlic has been fried is an excellent antiseptic applications for scabies and maggots infesting ulcers, ulcerated surfaces and wounds. Its juice mixed with salt is applied to bruises and sprains and also to relieve neuralgia and earache. Garlic is applied *externally* for deafness and pain. Garlic juice mixed with 3 or 4 parts of ordinary or distilled water (succus allii) has been used as a lotion for washing wounds and foul ulcers. Definite improvement in the condition of infected wounds was noticed within 24 hours after washing with this lotion and a very marked and decided improvement within 48 hours. Not only was the purulent discharge markedly decreased but the pain was also considerably relieved and in some cases it entirely disappeared. No injury to the tissues could be noticed as a result of application of this solution. Though the carbolic acid co-efficient of this solution was found to be rather lower than other antiseptics (Rideal-Walker co-efficient=2), it possesses the distinct advantage of being much less irritant to the tissues than carbolic acid. Whereas it is seldom possible to use carbolic acid lotion in a greater strength than 1 in 40 (2½ per cent), the succus allii can be employed in a strength of 20 to 25 per cent without apparent injury to the tissues. Some states that he has used allium preparations in the treatment of suppurating wound and foul ulcers for 15 years and obtained very satisfactory results. Garlic is robbed over ringworm with relief. A clove or two of garlic boiled in half ounce of gingilly oil is useful as ear-drops in atonic deafness and to allay

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the pain in otorrhoea. *Expressed juice* is applied in case of elongated uvula with some good effect, like that of silver nitrate. Like onion, garlic produces copious diuresis and therefore it is used in dropsy or anasarca.

Decoction of Garlic

Take of garlic 32 tolas, water 4 seers, milk 4 seers; boil together till the water is evaporated, and strain. This decoction in milk is given in small doses, in hysteria, flatulence, sciatica and heart disease.

Svalparasuna Pinda

Take of garlic 12 tolas, asafoetida, cumin seeds, rock salt, sonchal salt, ginger, long-pepper, and black-pepper each one-eighth of a tola; powder them finely and mix. Dose is about 20 grains every morning with decoction of the root of the castor oil plant, in facial paralysis, hemiplegia, sciatica, paraplegia and convulsive affections. This medicine should be continued for a month.

Veterinary Value of Garlic Oil Essence

Scientists emphasises the value against parasites located elsewhere than in the digestive tract of the volatile organic sulphur compounds which are absorbed by the blood stream, and so distributed to every part of the body. As a source of these compounds we naturally turn, to onions and garlic. After pointing out the wisdom of feeding dogs twice weekly with boiled onions, he commends as a medicine a teaspoonful of garlic juice, remarked, however, that the juice must be absolutely fresh and that a preserved product has little to commend it.

The compounds of medical value may, on the other hand, be isolated either in the form of essential oil, or essence. When the garlic plant is distilled in a current of steam, the essential oil, consisting almost entirely of the sulphur compounds, distills over with the steam, and when the vapours are condensed, it separates from the distillation water as an oil. The yield of oil is only about 0.005 to 0.009 per cent of the weight of plant distilled. This oil, of course, is very expensive, and would be a most difficult article for the ordinary fancier, because of its great potency. The outer form in which the valuable sulphur compounds are isolated is essence of garlic, which contains all the components of the oil in a form in which they will not deteriorate–all the sugars acids, &c., of the juice having been eliminated. The essence is, of course, much less potent than the oil; but it has the great advantage that, whilst containing all the medicinal compounds of the oil in a stable form, it can be easily handled by the ordinary fancier. One ounce of essence should be diluted to about a pint, to make a suitable medicine, of which one teaspoonful is the correct dose for a dog of medium weight.

The best medium in which to administer garlic (*i.e.* the best article with which to dilute the garlic essence) is undoubtedly not sugar, as is often supposed, but oil-olive oil, nut oil, cottonseed oil, cereal oil, &c. Oil has two great advantages. In the first place, by its soothing action, it prevents any irritation of the delicate membranes; in the second place, it aids adsorption of the medicine into the blood stream, with consequent distribution to all parts of the body.

A word of warning in connection with garlic preparations is desirable. Any preparation purchased should be guaranteed pure garlic, free from mustard oil, artificial mustard oil, or any nitrogen compounds. Essential oil of mustard (obtained by the steam distillation of mustard seeds) consists almost entirely of the sulphur compound allyl isothioctanate, with traces of ally cyanide. Its odour and characters are remarkably like those of garlic oil, but actually its components are derivatives of prussic acid. As artificial mustard oil (allyl isothiocyanate) is sold commercially at about 3s. 6d. a pound, whereas genuine garlic oil is about £2 per oz., the danger is obvious.

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A word of encouragement to those who are dubious about the value of garlic may not be out of place. One of the real old-fashioned remedies for distemper-used long before the chemistry of these essential oils was known–was oil of asafoetida, an oil which owes both its disagreeable odour and its medicinal value to the organic sulphur compounds. This oil, however, bas a much lower organic sulphur content than garlic oil.

Alnus glutinosa
(Family: Betulaceae)

Vernacular Name

Eng.–Alder.

Botanical Description

A deciduous shrub or medium-sized tree with darkish-brown, fissured bark and glabrous twigs with yellow lenticels (wart-like structures) on the bark. The leaves are broadly rounded or sometimes notched at the tip, often doubly serrate, bright-green on both sides and very sticky (viscid) in the spring. Alder is monoecious; the flowers are borne on the old wood and appear before the leaves arranged in catkins. The long, dangling male catkins have purplish scales and yel1ow flowers; the short female catkins are nearly globular, reddish-purple in early spring but they become brown and woody after the seeds have been released forming cones or 'berries'. The fruit is a winged achene.

Habitat

Alder is native to Europe, Asia and Africa. It grows in wet woods and by lakes and streams. It is common throughout most of the British Isles. The wood is light and easily worked when seasoned. The common name, Alder, supposedly comes from the Anglo-Saxon word *alor* or *aler*, which in turn may derive from an old German word *elo* or *elawer* (reddish yellow), a reference perhaps to the colour of the fresh-cut wood.

Grey Alder (*A. incana*) is similar to Alder but it has smooth greyish bark, its leaves are pointed and are greyish green above and pale below. It is not native to the British Isles but it has become naturalized in some places. Green Alder (*A. viridis*) is more of a shrub than a tree. Its leaves have a pointed tip, cordate base and are green on both sides. It grows in mountainous areas on the Continent. All species of alder have similar medicinal properties and are popular remedies.

Constituents

Isolation of lupenol (0.26), betulin (0.22), betulinic acid (0.21), taraxerone (0.03), taraxerol (0.005) and β-sitosterol (0.05%) from bark.

Uses

The sticky young leaves and the bark, best of all from felled trees, are used medicinally. The constituents include tannins and anthraquinones which give Alder an astringent action and a bitter taste. It is used to treat enteritis, severe diarrhoea, fever, colds and rheumatic pain. Externally a decoction of Alder is used as a gargle for tonsillitis and as a mouth wash. The fresh crushed leaves soothe chapped skin.

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Aloe indica; A. barbadensis

(Family: Liliaceae)

Vernacular Names

Sans.–Ghrita-kumari; *Eng.*–Indian alces; *Hind.*–Ghikanvar, Kumari; *Ben.*–Ghrit-kumari, Musabbar; *Guj.*–Kunvar; *Mah.*–Pivalaboel, Korphad; *Tel.*–Kalabanda. *Tam.*–Kattalai, Kumari; *Can.*–Kathaligida; *Mal.*–Kattavala. *Duk.*–Musanbar; *Punj.*–Elwa; *Kash.*–Musabbar.

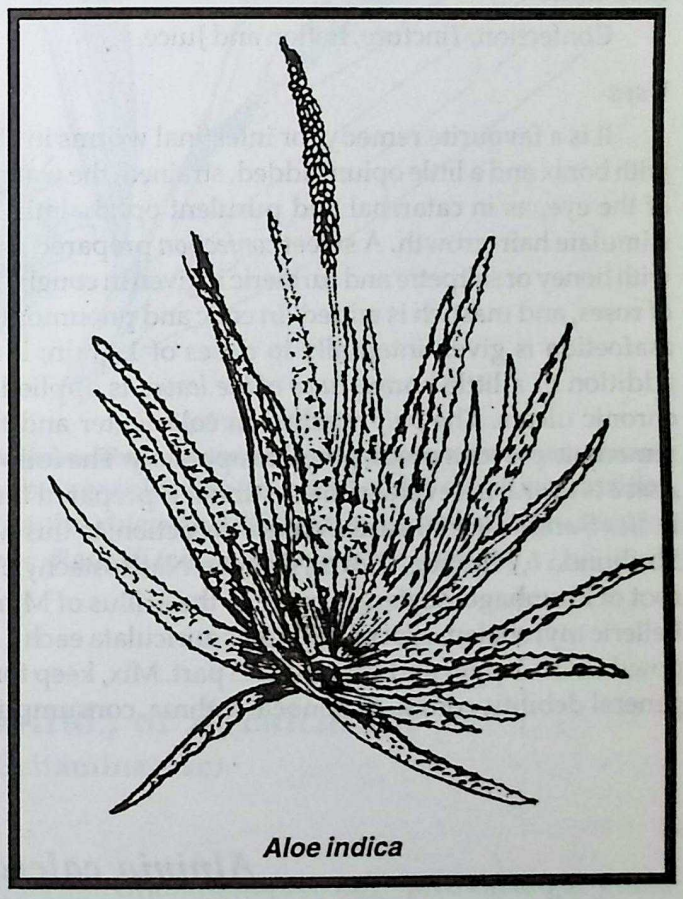
Habitat

Cultivated throughout India in many varieties some of which run wild as on the coasts of Mumbai, Gujarat and South India.

Aloe abyssinica is grown in Jaferabad in Kathiawar. Aloe vera of A. barbados have become completely naturalised in India especially in the hot dry valleys of north-western Himalayas and throughout the central table-land extending as far as Cape Comorin.

Parts Used

Expressed and dried juice of leaves.



Aloe indica

Varieties

Aloe litoralis (Seaside aloes); Arabian Aloes or Aden Aloes known as *Yamini* or *Moka*, yielded by *Aloes Indica*. It is of a blackish colour, shining on the surface, porous and translucent; when held before the sunlight the colour changes to red. It is also known as *Bandhano Eliyo* and *Petino Eliyo*. The former is mixed with stone, clay etc., and is wrapped up in mats; the latter is clean and is packed in boxes. Cape Aloes is yielded by Aloes spicata. Aloe socotrina (B.P.), Zanzibar Aloes, Bombay Aloes are other varieties.

Constituents

Mixture of polysaccharides containing pectic acid, a D-galactan, a glucomannan and an arabinan; D-galactan composed of galactose (92.9) and galacturonic acid (3.8%); a glucomannan fraction isolated from leaf pulp containing glucose and mannose (1:22) and structure of its repeating unit assigned; a galactomannan from plant, on hydrolysis gave glucose, mannose and galactose in molar ration of 2:2:1, together with very small amounts of arabinose and rhamnose; chemical studies showed it to be linear polymer having glucose, mannose and galactose units linked by 1,4-bonds; an acidic oligosaccharide containing galacturonic acid and galactose in molar ratio of 5:1, obtained by controlled hydrolysis of pectic acid; chemical studies showed that galacturonic acid residues were (1→4) linked and galactose was glycosidically linked to 0-3 of galacturonic acid residues.

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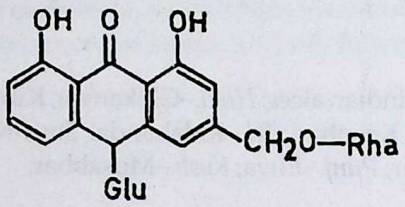
Glycoside–aloinoside B (2%)–isolated.

New Compounds



Aloinoside B

Action

Stomachic-tonic in small doses; in large doses, purgative and indirectly emmenagogue and anthelmintic.

Preparation

Confection, Tincture, Lotion and Juice.

Uses

It is a favourite remedy for intestinal worms in children. Dissolved in attar of roses, or in water with borax and a little opium added, strained, the water or *lotion* is applied to eyes in various affections of the eye, as in catarrhal and purulent ophthalmia. Dissolved in spirit it is used as a hair-dye to stimulate hair-growth. A sweet *confection* prepared from the pulp of the leaves is given in piles. *Pulp* with honey or saltpetre and turmeric is given in coughs and colds. To correct its griping effect confection of roses, and mastich is added. In colic and pneumonia of infants its *inspissated juice* with a little gum asafoetida is given internally in doses of 1 grain; it may also be given in mother's milk with the addition of a little borax. *Juice of the leaves* is applied to painful inflammations of the body and to chronic ulcers. The *pulp* washed in cold water and then mixed with a little burnt alum is a good remedy to persons predisposed to apoplexy. The following Ayurvedic preparation known as *Kumari Asava* is useful in several ailments and it is prepared thus: Take of Aloe-juice 100, Jaggery 20, Cannabis Indica 5 and water 50 parts. Make a decoction; to this when ready add honey 1, flowers of Woodfordia fibribunda 6, Nutmeg, Cloves, Cubebs, Nasdostachys, *Jatamansi*, dried unripe spikes of black-pepper, root of Plumbago Zeylanica mace or the arillus of Myristica Officinalis, the gall of Rhus succedanea, Belleric myrobalan, root of Aplotaxis auriculata each 1 part, *Tamra Bhasma* and *Loha Bhasma* (prepared powders of Copper and Iron) each ½ part. Mix, keep for about a month old allow it to ferment. Used in general debility, cough, dyspnoea, asthma, consumption, piles, epilepsy, colic and tympanitis.

Alpinia calcrata Rose
(Family: Zingiberaceae)

Botanical Description

Perennial rhizomatous herb; leafy stem about 1-2.5 m high; leaves linear, lanceolate acuminate, glabrous, upto 40 × 8 cm; flowers white with red lip in terminal panicle about 15 cm long; calyx white

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tubular, lobed at apex; corolla tube as long as calyx, lateral lobes oblong, apically concave, upper one broader, lebellum variegated with red and yellow, to 3 × 1 cm, margin fimbriate, apex rounded; staminodes teeth-like, filament flattened, anther cell apically diverging. Ovary densely pilose, 3-celled, ovules many on axile placenta, stigma subglobose.

Alpinia calcrata

Habitat

The plant is common along W. Ghats. Often cultivated in Sri Lanka, Malay Peninsula and China.

Uses

Cataka includes *rasna* in the *Vayasthapana varga*, the group of drugs that are capable of maintaining the youthful vigour and strength. The drug is also a popular remedy for rheumatism, intermittent fevers, dyspepsia, cough, bronchitis, asthma and other respiratory ailments. It is bitter, hot and aromatic and overcomes *kapha* and *vata*, poison, intestinal and biliary colic. The drug stimulates digestion, purifies blood and improves voice. The officinal part is the rhizome which forms a major ingredient of preparations like *Rasnadi kasayam, Rasnadi curnam, Rasnadi tailam, Asvagandharistam*, etc.

Alpinia galanga, Willd., or *A. calcarata*

(Family: Scitaminaceae)

Vernacular Names

Sans.–Sugandhavacha, Mahabaravach, Kulinjana, Dhumparastma; *Eng.*–Java Galangal, grand or greater galangal, galanga cardamoms; *Duk. Bom. & Hind.*–Saphed-panaki-jhad, Barakulinjan, Kulanjan; *Mah.*–Kosht-kulinjan; *Ben.*–Sugandha-vacha, Kulinjan; *Can.*–Dhumarasmi; *Mal.*–Chitta-ratta; *Tam.*–Periareta, pera-rattai; *Tel.*–Pedda-dhumpa, rash-trakam; *Pers.*–Khusravedurue-kalan; *Arab.*–Khulanjan-e-Kabir, Khulanjan-e-qasbi.

Habitat

South India and Bengal.

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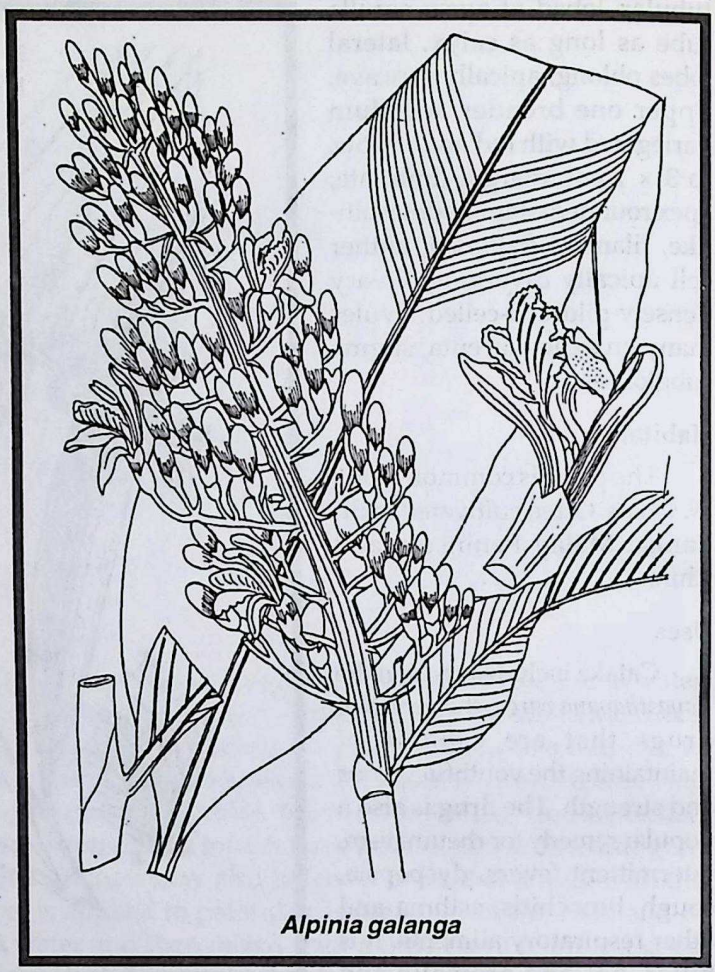
Parts Used

Rhizome and fruit.



Alpinia galanga

Constituents

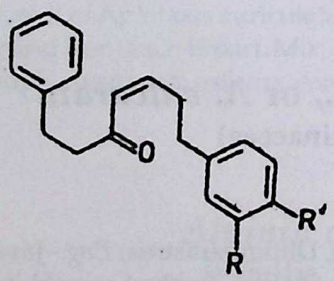
According to Chemist Jahus, galanga root contains these three different compounds-campheride, galangin and alpinin. From the green rhizomes, a pale yellow volatile essential oil (one of the important constituents of the drug) with a pleasant odour can be obtained on distillation. This oil contains 48 per cent of methyl cinnamate, 20 to 30 per cent of cincole, camphor and probably d-pinene.

Detection of caryophyllene oxide, geraniol, eudesmol, citronellyl, acetate, citronellol, β-caryophyllene, α-pinene, linalool, 1-α phellandrene and geranyl acetate in volatile oil from rhizomes by GLC.

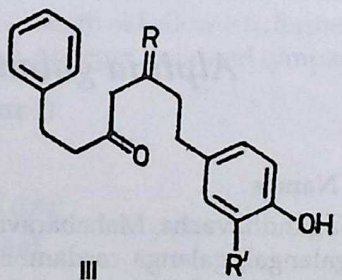
Essential oil contained α- and β-pinenes, 1-8-cineole, linalool, cedrol and eugenol.

Two new diarylheptanoids-1,7-diphenylhept-4-en-3-one (I) and 7-(4″-hydroxy-3″-methoxyphenyl)-1-phenylhept-4-en-3-one (II) –isolated along with 1,7-diphenyl-5-hydroxy-3-heptanone and 5-hydroxy-7-(4″-hydroxy-3″-methoxyphenyl)-1-phenyl-3-heptanone from rhizomes; their structures elucidated; three more diarlheptanoids (III-V) isolated.

New Compounds



I
R, R' = H
II
R = OMe, R' = OH



III
R = O, R' = OMe
IV
R = H, OMe, R' = OMe
V
R = H, OH, R' = H

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Biological Activity

Diaryl heptanoids (III, IV and V) exhibited prostaglandin biosynthesis inhibiting activity.

Action

Aromatic, stimulant and bitter; stomachic and carminative. The tubers and seeds are said to possess carminative properties. "The drug has a slight irritant action on the mucous membrane of the stomach and this may be used in producing a reflex increase in the bronchial secretion. As the oil is excreted through the lungs, it acts as an expectorant."

Pharmacological Action

Intravenous injections of small doses of a tincture or an infusion of A. galanga, produce a sharp fall in blood pressure in experimental animals. The blood pressure, however, comes to normal in a short time. The fall in blood pressure is accompanied by a rise in the volume of the intra-abdominal organs like the spleen and the intestines showing that dilatation of the splanchnic blood vessels is one of the causes of the fall of blood pressure. The contractions of both the auricle and the ventricle are lessened showing that the drop has a depressant action on the heart. Dilatation of the peripheral blood vessels is observed when they are perfused with physiological saline solutions containing various concentrations of the drug. The drug is a depressant to the cardiovascular system.

Respirations in experimental animals are stimulated in small doses but depressed with larger ones, the respiratory centre being paralysed. The important action of the drug is, however, on the bronchioles. Even small doses produce a dilatation of the bronchiles and this effect is much more pronounced when the dose is increased. Asthma-like conditions produced artificially in animals by administering pilocarpine are immediately relieved by small doses of the tincture of A. galanga.

The drug has no marked action on other systems of the body. The secretion of urine is slightly diminished, but this effect appears to be vascular, for the rate of secretion comes to normal as soon as the blood pressure comes to normal. The isolated uterus is relaxed and its contractions become regular. The action of the gastro-intestinal tract is similar to that produced by other essential oils.

Preparation

Powder (dose–5 to 10 grains), Tincture (1 in 10) dose–½ to 1 drachm, Paste made with any bland oil to apply locally in skin diseases.

Uses

The plant is fairly largely used in Southern India. In Mysore, it is a domestic medicine much used by old people with bronchial catarrh. The rhizomes are useful in rheumatism and catarrhal affections. Tubers and seeds are used as a fragrant adjunct to complex prescriptions. Hakims consider these to be a good remedy for impotence and nervous debility. The drug is a popular remedy for many respiratory ailments. Yajolu found that administration of a paste of A. galanga in honey lessened the paroxysms of cough in young children suffering from whooping cough. He also found that in young children suffering from bronchitis, administration of this drug relieved the distressing symptoms and also had a favourable action on the temperature of the patients. The drug, therefore, promises to be of use in respiratory troubles especially those of children. The antispasmodic action of the drug may also prove useful in conditions like asthma.

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In affections of the gastro-intestinal tract the drug can be used like other volatile oils. It has got the advantage of having a very pleasant odour and thus may be used in cough and digestive mixtures. It has been suggested that it may be useful in intestinal and biliary colic.

Used also in dyspepsia, fevers, incontinence of urine and also advocated in diabetes mellitus and said to diminish the quantity of urine; it is used to destroy bad smell in the mouth and in other parts of the body; used to improve the voice in throat affections.

Alstonia scholaris, R. Br.
(Family: Apocynaceae)

Vernacular Names

Sans.–Saptaparna, visaltvak, brihatvaka; *Eng.*–Dita Bark; *Hind.*–Datyuni, Chhatiun; *Ben.*–Chhatim; *Mah.*–Satveen; *Tel.*–Palagaruda, Aedakularitichettu, Edakula pala; *Tam.*–Aelil-appalai, wodrasi; *Can.*–Hale; *Mal.*–Daivapal, aerilampal; *Kon.*–Santhni-rooku, Kadusalle-rooku.

Habitat

Wildly cultivated throughout India; found in sub-Himalayan tract from the Jamuna eastward ascending to 3000 feet; abundantly found in Bengal and South India.

Parts Used

Leaves and bark; milky juice.

Constituents

Bark contains alkaloid "*ditamine*" and *echitamine* (Bacon) and *echitenine*; also *echicaoutchin*, an amorphous yellow mass. *Echicerin* in acicular crystals; *echitin* in crystallized scales, *echitein* in rhombic prisms (a crystallisable acid) and *echiretin* an amorphous substance, resembling an alkaloid, a fatty acid and fatty resinous substances. An uncrystallisable bitter principle called "ditain" isolated long ago was ascribed the febrifuge properties of the drug. *Ditamine* can be separated from its solutions by making them alkaline with sodium bicarbonate and extracting with ether; *echitamine* is obtained by making the solution strongly alkaline with NaOH and extraction with chloroform. The principal alkaloidal constituent of A. Scholaris and other allied species such as A. congensis, A. gilletii, A. angustiloba and A. spathulata was *'echitamine'* ($C_{22}H_{28}O_4N_2$). This alkaloid, however, was found to be absent in other representatives of the Alstonias, e.g. A. constricta, A. macrophylla, or A. villosa. Reported the presence of four alkaloids in A. constricta, of which *'alstonine'* was considered the chief one and was obtained in crystalline form as sulphate.

Echitamine hydrochloride, mp. 286°, isolated; chemical degradation studies and structure assignment of echitamine; crystal structure of echitamine; triterpenes-α-amyrin acetate, lupeol acetate, substance A, mp. 224°, and substance B, mp. 215°-isolated from bark; an indole alkaloid-picrinine (desacetyl-desformyl-picraline)-isolated from leaves; α-amyrin, its acetate, lupeol acetate, stigmasterol and α-sitosterol from root bark.

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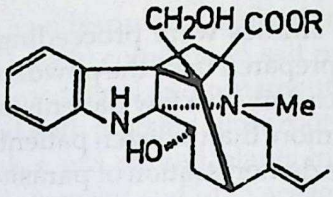
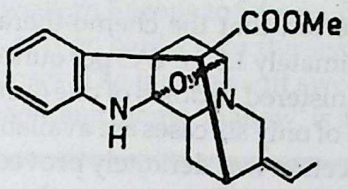
New Compounds



Echitamine
R = Me
Nerifoline
R = H



Picrinine

Action

Stimulant, carminative, stomachic, bitter tonic, astringent, aphrodisiac, expectorant, febrifuge, alterative and anti-periodic. Bark of the tree has been reputed in Ayurveda for ages as febrifuge, alterative, tonic and gastro-intestinal sedative. *Ditamine* or *ditanin* possesses anti-periodic properties equal to the best sulphate of quinine without its disagreeable secondary symptoms; but its febrifuge effect is not lasting. Bacon found that in action the alkaloid *'echitamine'* is not a protoplasmic poison like quinine or emetine. Amoebae suspended in a 1 per cent solution of *echitamine* hydrochloride seem to thrive; there is no decrease in their motility even after exposure for 2 hours. The use of 'dita' extract in place of quinine for malaria and for amoebic dysentery would thus seem to be of doubtful value. Echitamine produces only slight action even in doses of 5 mgm.

Some tried the alkaloids 'echitamine', 'distamine', 'akuammine' and 'harmine', in bird malaria, and found them inactive except 'echitamine' which produced feeble action in doses of 5 mg. per dose, and recorded the inactivity of alstonine sulphate in bird malaria.

Preparations and Their Doses

Of the infusion, 1 to 2 ozs., of the tincture, 1 to 2 drachms diluted in water and of *dilanin* 5 to 10 grains given two or three times a day. An extract is prepared from the fresh bark and given in milk in cases of leprosy. It is also used as an anthelmintic.

Preparation of Amritashtakapachana

Take of the bark of Alstonia scholaris, *gulancha*, leaves of Adhatoda vasica and Trichosanthes dioica, tubers of Cyperus rotundas, Calamus rotung, catechu and *nim* leaves and prepare a decoction in the usual way. *Dose*-One to two ounces two or three times a day.

Uses

Bark is valuable in debility and after-effects of fever, also in chronic diarrhoea, dysentery and in catarrhal fever. Equal doses of ditamine and sulphate of quinine were said to have the same medicinal effects as quinine, in malaria and other malignant tertian fevers, as in the Manilla Hospital results of trials obtained in malaria were very satisfactory; and when tried in 14 cases of malaria in India, in all cases it caused the temperature to fall steadily to normal in a short time. No perspiration and over-exhaustion of the patients were induced. Treatment for a few days only was sufficient to cure the patients. The drug A. Scholaris seems to produce good effects in cases where the catarrhal conditions of the mucous membrane of the intestines have lasted for some time. It does not seem to produce any

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marked effect in ordinary diarrhoea and would completely replace quinine in malignant tertian fevers or diarrhoea where A. Scholaris, in some form or other, is not used.

During the period that the chemo-therapeutic studies were proceeding, a tincture (1 in 10), containing approximately 1.3 gr. TAS per ounce, was prepared from the powdered bark of A. Scholaris and this was administered in doses of one ounce thrice daily in a few patients suffering from malaria. Authentic records of only six cases are available, but more than a dozen patients were treated. In four cases, malarial infection was definitely proved by the demonstration of parasites (BT parasites in one and MT parasites in three). In two cases, the presumption was drawn from symptoms and previous history associated with palpable spleen, but parasites were not detected in the peripheral blood, at the time of admission. In none of these cases, according to the opinion of the physicians in charge, did the tincture of Alstonia produce any significant way the course of the disease. The temperature chart of three patients, however, showed a distinct drop in fever almost immediately following or about half an hour after doses of the tincture were administered. The patients appeared during these periods to be comparatively free from subjective symptoms such as headache, nausea, etc. On critical examination, this mild reduction in temperature has been ascribed by the physicians to simultaneous coincidence rather than to any direct effect of the drug. At any rate, no demonstrable anti-malarial action could be proved. It is possible that the slight reduction in temperature may be the result of central action of TAS contained in the tincture, as is observed after the administration of centrally-acting antipyretics. These three doctors conclude that careful investigations in the laboratory and in the clinic of the total alkaloids isolated from A. Scholaris, and also of a tincture (1 in 10) made from the powdered bark show that, contrary to popular belief and the earlier records of clinical trials with the drug, A. Scholaris has little or no demonstrable action in malaria induced in monkeys and naturally occurring in human patients. It cannot, therefore, be recommended as a substitute for quinine and other cinchona alkaloids.

Milk juice is applied to ulcers and to rheumatic pains; mixed with oil and dropped into ear it relieves earache. *Tincture* of the bark acts in certain cases as a powerful galactagogue. *Juice of the leaves* with that of fresh ginger-root or zedoary is administered to women after confinement. The drug is also used in cases of snake-bite.

Althaea officinalis, Linn.

(Family: Malvaceae)

This is the English marsh-mallow which yields guimauve.

Vernacular Names

Hind., Duk. & Bom.–Gulkhairo, Gul-i-khere (flowers); *Tam.*–Shemaitute; *Pers.*–Tukm-e-khitame (fruits, carpels) or Reshai-i-Khitame (roots); *Eng.*–Marsh mallow root.

Botanical Description

A perennial herb with a yellow, branched root, tall, erect, leafy stems and large alternate, lobed and irregularly toothed leaves. The stems and the leaves are velvety. The white or pinkish flowers, which are attractive to bees, are arranged in irregular racemes in the leaf axils. The disc-shaped schizocarpic fruit (a capsule) splits into one-seeded nutlets (mericarps). The fruits are popularly called 'cheeses' because of their rounded form.

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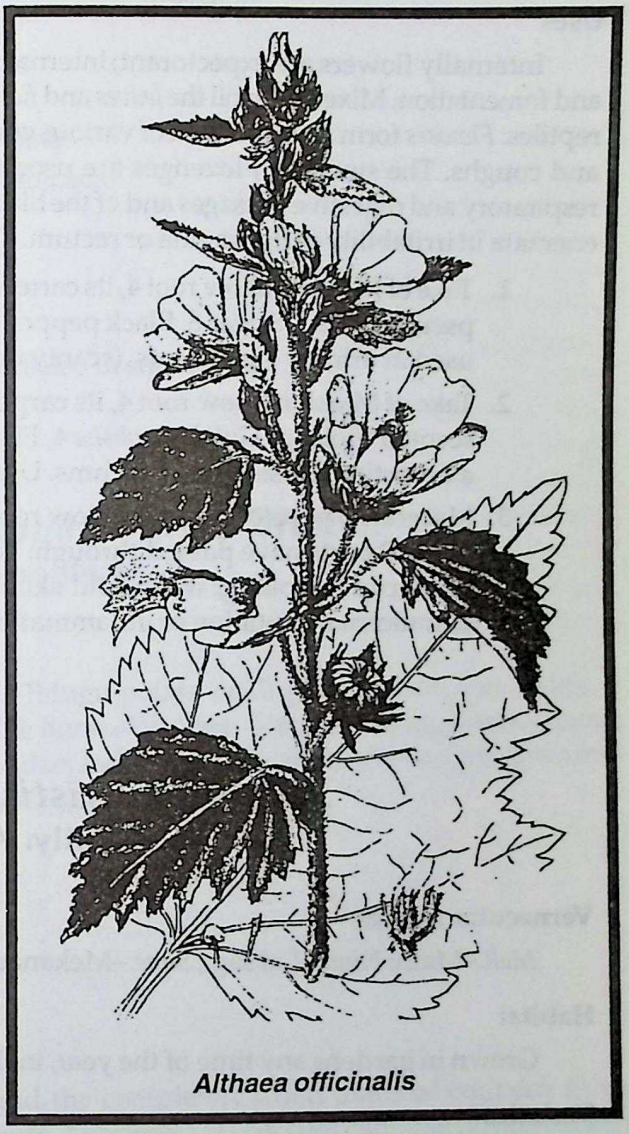
Habitat

Marshmallow has a widespread distribution from western Europe to Siberia. In the British Isles, where it is native, it is locally common in salt marshes and on banks near the sea. It has long been cultivated for culinary, medicinal and ornamental purposes. The familiar soft sweet, marshmallow, was originally flavoured with marshmallow root. In the common name 'mallow' is a corruption of the Latin name *malva* for this and related plants in the Malvaceae family. Both *malva* and Malvaceae probably come from the Greek word *malakos* (= soft), a reference to the softening and healing properties of these herbs. Marshmallow remains a popular herbal remedy fur a variety of ailments and is cultivated commercially in some countries, but not in Britain.



Althaea officinalis

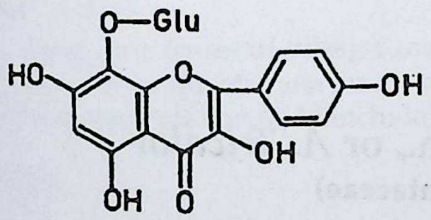
Parts Used

Flowers, Carpels, Leaves and Root.

Constituents

A flavonol glycoside-herbacin-isolated; kaempferol, its 3-glucoside, quercetin, its 3-glucoside, cyanidin-3-glucoside and 3-rutinoside isolated.

New Compounds



Herbacin

Root contains a little starch, nearly 20 per cent of the gum or mucilage, some uncrystallizable sugar and a crystallizable principle and other unimportant constituents. The crystalline principle *althaein* "seems to be identical with the asparin" of asparagus.

The whole plant has a medicinal action. It must be free of rust. Marshmallow is one of the most important mucilaginous medicinal herbs because it contains a high percentage of mucilage (flowers up to 20 per cent, roots up to 30 per cent) and it is included in proprietary medicines and herbal preparations as an emollient, demulcent, antitussive and expectorant. Among its other constituents are sugar, starch, an amino acid (asparagine) and pectin. Marshmallow is used internally for bronchitis and asthma and for stomach and intestinal disorders. It also makes soothing gargles and compresses and poultices for external use. It has many cosmetic uses too. The roots can be boiled and eaten as a vegetable.

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Preparation

Decoction, powder and syrup.

Action

The plant is suppurative and emollient.

Uses

Internally flowers are expectorant; internally the root is a demulcent. *Leaves* are used for poultice and fomentation. Mixed with oil the *leaves* and *flowers* are applied to burns and parts bitten by venomous reptiles. *Flowers* form an ingredient of various cough mixtures. *Carpels* are useful in urinary complaints and coughs. The sweet soft lozenges are used for sore-throat. *Root* is given in irritable state of the respiratory and digestive passages and of the bladder and intestines. Its *decoction* is used as an emollient enemata in irritability of the vagina or rectum. The following are useful household remedies:

1. Take of Marsh mallow root 4, its carrels 4, Bonduc seed 4, *Gokharu* 4, cubebs 5, rhizome of Iris pseudocorus 2, Sugar 6, Black pepper 1 part. Mix and make a powder. Dose-grains 10 to 20; used in urinary complaints, (scanty urine, gonorrhoea) etc.
2. Take of Marsh mallow root 4, its carpels 5, Liquorice root 6, flowers of Viola dorata (sweet-scented Violet or *Guli Banaphsha* 4, Figs 5, Black raisins 5 and *Trikatu* 2 parts. Mix and make a decoction. Dose-½ to 2 drachms. Used in cough, asthma, etc.
3. Macerate 3 parts of marsh mallow root in 40 parts of water for 12 hours; strain, press, filter, until 32 parts have passed through. To this add 64 parts of sugar dissolve, warm and heat the syrup to boiling; when cold skim and strain through flannel. This syrup is used as a demulcent in irritation or inflammation of mucous membranes.

Amarantus tristis, Linn., or *A. Tricolor*

(Family: Amarantaceae)

Vernacular Names

Mah.–Math; *Hind.*–Lal sag.; *Sans.*–Mekanada; *Santhal.*–Pondgandhari.

Habitat

Grown in gardens any time of the year, in Bombay Presidency.

Varieties

Math is of two varieties–green and red.

Constituents

Amaranthine and isoamaranthine from leaves identified as O-(β-D-glucopyranosyluronic acid)-5-O-β-D-glucopyranosides of betanidine and isobetanidine respectively.

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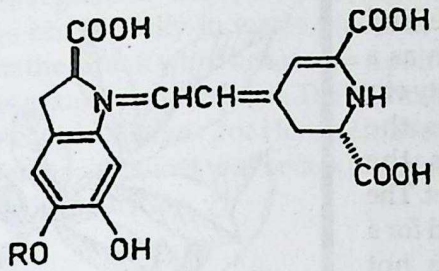
New Compounds



Amaranthine
R = Glu-Gluc.acid

Action

Demulcent, diuretic.

Uses

Leaves and young shoots are eaten boiled. Used also in snake-bite.

Amorphophallus Campanulatus, Blume.

(Family: Aroideae)

Vernacular Names

Sans.–Arsaghna (curer of piles), Kunda; *Eng.*–Telugu potato or Elephant's foot; *Bom., Mah. & Hind.*–Jangli suran or alu, Madana masta, ol; *Ben.*–Ol; *Burm.*–Wa; *Tam.*–Karuna kalang, Karakkaranai; *Tel.*–Thiya-kandha, Poti-kunda, Manchi-kunda-guddae; *Mal.*–Kizhanna; *Mah.*–Suran; *Can.*–Suvarna-gadde.

Habitat

Bombay Presidency, India.

Parts Used

Corm or tubers, root.

Constituents

Fresh plant contains 78 per cent moisture; and the completely dried material contains Ether extract 0.50 per cent Albuminoids 12.18 per cent (contg. Nitrogen 1.90 per cent); soluble carbohydrates 76.28 per cent, woody fibre 4.00 per cent, and Ash 7.04 (contg. Sand 0.18 per cent) respectively. Tubers contain an acrid juice.

Preparation

Powder. Dose-5 to 10 grains. Confection known as *Laghu Suruna Madaka* or *Brihat Suran Madaka* containing *Madanmust*, treacle, *trikatu* and plumbago-root, equal parts: dose-½ to 2 drachms in dyspepsia.

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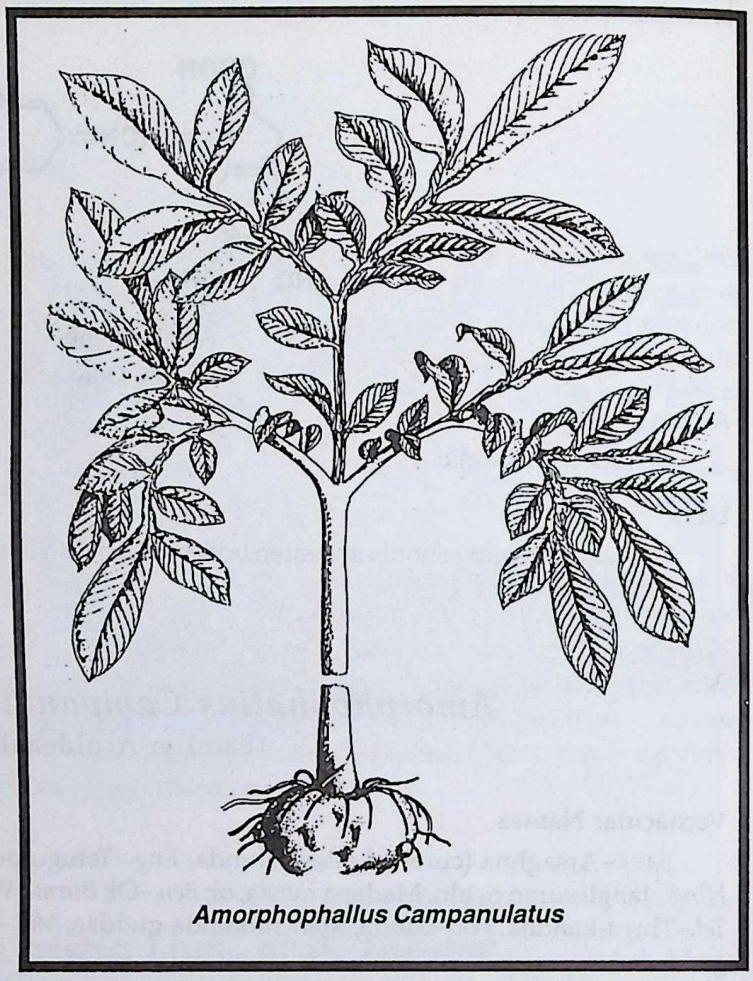
Action

Stomachic, carminative and tonic; used in piles and given as a restorative in dyspepsia, debility etc. It is the corm which gives the vegetable and which has the appearance of an elephant's foot. The corm, if stored well, keeps good for a considerable period. It is a hot carminative in the form of a pickle.

Uses

Root is used in boils and ophthalmia, also as an emmenagogue. *Acrid juice of the tubers* should be got rid of by thorough boiling and washing lest it otherwise irritate the mouth and fauces; they are regarded good in haemorrhoids. The vegetable is considered nutritious and wholesome when cooked. It is boiled like potatoes and eaten with mustard; or it is cooked in curries, or it is cut into slices, boiled with tamarind leaves, and made into pickles; it is also cooked in syrup and made into preserve. The plant, when dead and dry, is greedily eaten by cattle.



Amorphophallus Campanulatus

Anchusa officinalis

(Family: Boraginaceae)

Vernacular Name

Eng.–Alkanet

Botanical Description

A biennial or perennial herb with a black taproot, which bears a basal rosette of narrow, lanceolate leaves the first year and, in the following years, an erect stem with sessile, lanceolate leaves. The red, later blue, funnel-shaped flowers are arranged in several axillary and terminal, coiled cymes. All parts of the plant are softly hairy. The fruit separates into four one-seeded ovoid nutlets (mericarps) with protuberances on the surface. Like Borage (*Borago officinalis*), which is a member of the same family, Boraginaceae, Alkanet is an important source of food for bees.

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Habitat

Alkanet is native to the warmer regions of Europe where it grows on sunny banks and waste ground. In the British Isles it occurs occasionally in waste places as a garden escape. The generic name, *Anchusa*, is said to derive from the Greek word *aghousa* (= a paint) because the root of a related species, *A. tinctoria*, was once used as a source of a red dye. The common name is also connected with dyeing. It is a corruption of the Arabic word *al-hinna'* for Henna (*Lawsonia inermis*), the shrub still used as a source of a reddish-brown dye for hair. Alkanet was once a popular remedy for heart and urinary disorders, but is now seldom used by herbalists.

Uses

The flowering stems, sometimes also the roots and flowers, are used medicinally. The constituents include silicic acid, the alkaloids cynoglossine and consolidine, mucilage and pigments (anthocyanins). These substances give Alkanet an expectorant action and it is thus used in herbal medicine to treat coughs, bronchitis and other chest and throat infections. The tender young leaves are a rich source of vitamin C and they can be eaten raw in salads or cooked like spinach. The plant's rough surface may, however, irritate the skin.

Andrographis paniculata, Nees.
(Family: Acanthaceae)

Vernacular Names

Sans.–Bhunimba, Mahatikta (King of Bitters), Kirata; *Eng.*–The Creat, King of Bitters, Chiretta; *Hind.*–Kiryat, Mahatita; *Ben.*–Kalmegh; *Arab.*–Qasabuzzarirah; *Pers.*–Nainehavandi; *Guj.*–Kiryato, Olikiryat; *Duk.*–Kalafath; *Mah.*–Olenkirayat; *Tel.*–Nelavemu; *Tam.*–Nilavembu, Shirat-kuchchi; *Mal.*–Nilavaepu, Kiriyat; *Can.*–Nelabaevu.

Habitat

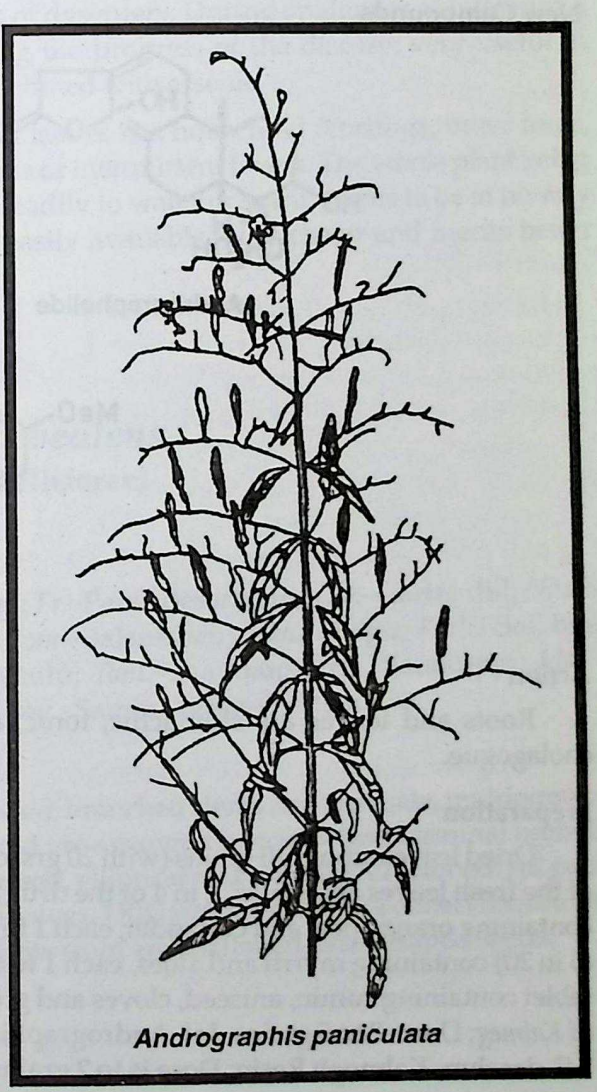
This annual is common in hedgerows throughout the plains of India, cultivated in gardens from Lucknow to Assam, especially in Bengal.

Parts Used

Whole herb.

Constituents

Dymock and his co-workers found that an aqueous infusion of the herb was intensely bitter and acid and thought that the bitterness was due an indifferent, non-basic principle. Gorter thought that the bitter substance in the leaves was a lactone



Andrographis paniculata

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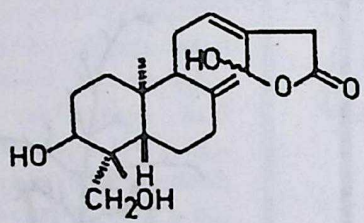
'andrographolid' of the formula $C_{20}H_{30}O_5$. Later investigations showed that the leaves contained two bitter substances and traces of an essential oil. The first bitter principle obtained as intensely bitter yellow crystals with formula $C_{19}H_{28}O_5$ and M.P. 206°. It did not respond to any tests for alkaloids and glucosides. The second bitter substance was obtained in an amorphous form and was named 'Kalmeghin' $C_{19}H_{51}O_5$, M.P. 185°. The plant as a whole contained a bitter principle and the ash a considerable quantity of Sodium Chloride and potassium salts. The plant is very rich in Chlorophyle. A green resinous extract is obtained by extraction with alcohol which is believed to be the active principle, called 'Kalmeghin' (Kalmegh Resin) and contains 0.6% alkaloid of the crude plant.

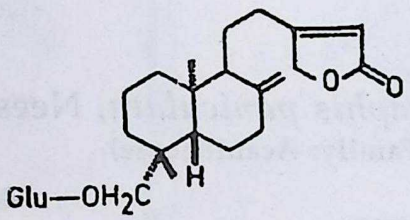
Used as curative or preventive in snake venom poisoning.

Pigments–andrographin, mp. 190° and panicolin, mp. 263°–from roots; β-sitosterol-glucoside, mp. 298°, a compound, mp. 230°, and an unsaturated ketone, mp. 113°, isolated from leaves; structure and stereochemistry of andrographolide, mp. 228° on the basis of chemical degradation; diterpene glucoside–neoandrographolide, mp. 167°; a new flavone–5-hydroxy-7,8,2',3'-tetramethoxyflavone (I)–from roots.

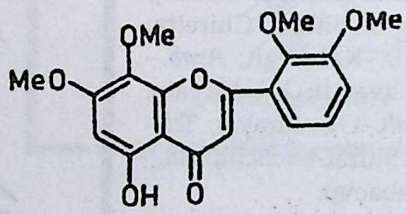
New Compounds



Andrographolide



Neoandrographolide



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Action

Roots and leaves are stomachic, tonic, antipyretic, alterative, anthelmintic, febrifuge and cholagogue.

Preparation

Dried leaves–about 10 grains (with 20 grs. of black-pepper). Succus (concentrated expressed juice of the fresh leaves and stalks, 1 in 4 of the drug); dose–10 to 60 minims. Compound infusion (1 in 20) containing orange peel and coriander, each 1 to 4 of the drug; dose–1 to 2 ounces. Compound tincture (3 in 20) containing myrrh and aloes, each 1 to 6 of the drug; dose–1 to 4 drachms. Compound pill or tablet containing cumin, aniseed, cloves and greater cardamoms, all in equal parts, mixed in the juice of *Kalmeg*; Dose–2 to 5 grains. Inf. Andrographis; Dose ½ to 1 fl. oz. Tinctura Andrographis; Dose ½ to 1 fl. drachm. Kalmegh Resin; Dose ½ to 2 grains.

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Uses

The shrub is well-known as "Kalmegh" and forms the principal ingredient of a household medicine called 'alui' which is extensively used in Bengal. 'Alui' is prepared and prescribed as follows-Take cumin, aniseed, capsules of greater cardamoms-pound them well with the expressed leaves at the juice of Kalmegh; the mass the prepared is divided into small pills and dried in the sun. One pill, rubbed down with human milk, is an ordinary dose. 3 to 6 Kirata Tablets or pills, each of 5 grains, are given every morning with water and honey, according to the virulence of attacks in malaria. Brigade Surgeon G.G. Hunter considers this superior to quinine. *Green leaves* are given with aniseed (4 to 20) as a stomachic and anthelmintic. *Green leaves* with the leaves of Aristolochia indica and fresh inner root-bark of country Sarsaparilla, made into an electuary, is used by Hakims of India as a tonic and alterative in syphilitic cachexia and foul syphilitic ulcers. *Tincture of the root* is tonic, stimulant and gently aperient. Expressed *juice of the leaves* alone or together with cardamom, cloves and cinnamon, "made into little globules, which are prescribed," as a domestic remedy in gripping, irregular stools, loss of appetite, flatulence and diarrhoea of children; is also anthelmintic. *Decoction or infusion of the leaves* has been used with satisfactory results in sluggish liver, neuralgia, certain forms of dyspepsia associated with gaseous distention of the bowels (gouty dyspepsia), in general debility, in convalescence after fevers and in advanced stages of dysentery. During epidemics of influenza a tincture of the plant is highly efficacious in arresting the progress of the disease; very useful in intermittent and remittent fevers, especially when combined with arsenic.

Decoction or strong infusion of the root-stalks and leaves is a household febrifuge, bitter tonic, alterative anthelmintic and anti-periodic, useful in ague or intermittent fevers. The whole plant being an intensely bitter substance, yielding its properties readily to water or spirit, seems to be in no way inferior to other bitters mentioned in the B.P. It is easily available, very cheap and merits better recognition.

Anethum graveolens
(Family: Umbelliferae)

Vernacular Names

Sans.–Misroya, Sthatpushpi; *Eng.*–Dill, Dill Seed; *Fr.*–Persil des inarais; *Ger.*–Garter dill; *Hind.*–Sowa; *Punj.*–Soya, Sowa; *Arab.*–Shubit; *Duk.*–Soyi; *Bom.*–Balantshep; *Mah.*–Shepu; *Kash.*–Soi, biol; *Ben.*–Soolpha; *Guj.*–Surva-nu-bi; *Tel.*–Shatakupivittulu; *Tam.*–Shatakupivirai, Satakuppi; *Mal.*–Chatukuppa; *Can.*–Sabbasige; *Sindh.*–Sadakuppa; *Burm.*–Samin; *Malay.*–Adaspudus.

Botanical Description

An annual herb with bluish-green, hollow, furrowed, branched stems and alternate, multipinnate, feathery leaves. The yellowish flowers lack sepals and are arranged in compound terminal umbels. The brown fruit, a double achene, is laterally compressed, elliptical and prominently ribbed. All parts of the plant are aromatic, the fruits more so than the leaves. Dill is very similar to Fennel (*Foeniculum vulgare*) but is distinguished by its annual habit, hollow stem and flattened, lens-shaped seeds.

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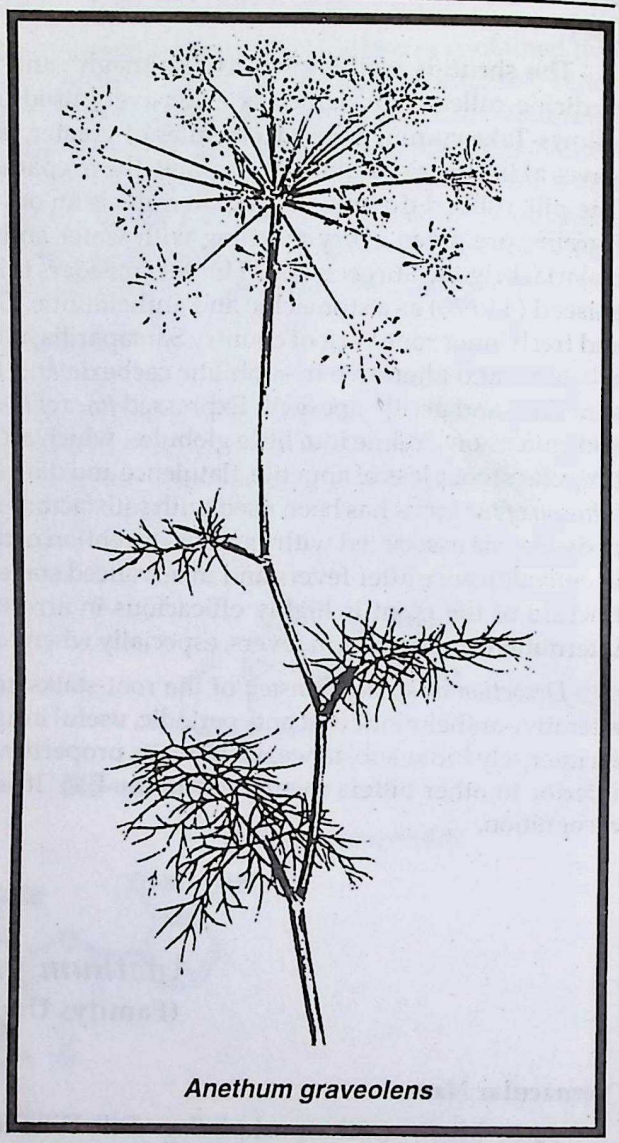
Habitat

Cultivated in Indian gardens for culinary purposes. As the fruit of the Indian variety is much more narrowly winged than the variety met with in Europe, it is considered by some to belong to a distinct species Anethum sowa, (Roxb.) or Peudecanum Sowa (Kurz).

Dill is native the eastern Mediterranean region and western Asia, but it has long been cultivated elsewhere. It was once an important medicinal herb for treating coughs and headaches and an ingredient of ointments. It is still widely used by herbalists but is chiefly known as a vegetable and seasoning herb. It is grown commercially in Britain only on a small scale but seeds imported from other countries are processed for their oil by British firms. The generic name, *Anethum*, is derived from the Greek word *anethon* for a related aromatic herb Anise (*Pimpinella anisum*). The common name, Dill, comes from the old Norse word *dylla* (probably meaning 'to soothe').



Anethum graveolens

Constituents

Dried ripe dill fruit contains a volatile oil 3 to 4 p.c., and fixed oil. The *volatile* essential oil is composed of anethine, phellandrene and d-limonene, and apiol (which is rather peculiar in its properties) termed 'dill apiol'; also carvol (carvone) and another hydrocarbon. The essential oils derived from Indian and foreign (English and German) fruits also differ in composition. The Indian oil shows a higher specific gravity, lower rotation, and a constituent with a high boiling point. The total, yield of the oil from the East Indian fruit is practically the same as that obtained from other sources. Thus, the English fruit yields about 4.0 p.c., German 3.8 p.c. and the East Indian about 3.19 p.c. of oil. In contra-distinction to other dill oils, the Indian oil is obtained in two different fractions-a fraction with a low specific gravity known as the "light oil" and another with a high specific gravity known as the "heavy oil". Genuine dill oil contains no constituent boiling at so high a temperature as 285° and no portion of the distillate sinks in water. On account of these differences, oil obtained from the dill fruit growing in India has not been accepted officially. Recently, some experiments were conducted with samples of Baroda oil from which the dill apion has been removed by distillation. This oil (without dill apiol) is said to correspond very closely to the official standards and might probably be used as a substitute.

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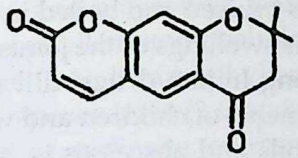
Scopoletin and new coumarin (I) characterised as 6,7-dihydro-8, 8-dimethyl-2H,8H-benzo-[1,2-b:5,4-b']dipyran-2,6-dione from dill; α-pinene, d-limonene, α-phellandrene and dillapiol present in essential oil.

Note: Anethum sowa has been wrongly assigned to Kurz in literature, since Kurz described it as *Peucedanum sowa* which was kept under *Peucedanum graveolens.*

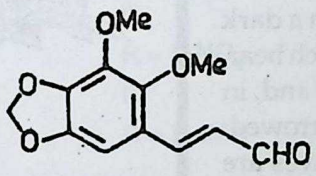
New Compounds



I

Carvone and d-α-phellandrene isolated form stem and leaves; improved method for isolation of carvone; commercial dill oil contained carvone 30% and (+) limonene 30-35% of (+) carvone; detection of anethofuran in essential oil; essential oil from fruits contained carvone (45.58%), dihydrocarvone, carvacrol, methyl benzoate, 1,5-cineole, p-cymene, α-phellandrene, limonene, safrole, α-terpinene and α-pinene; detection of α- and β-phellandrenes, limonene, p-cymene, octanal, tridecane, tetradecane, hexadecane, 4α-dimethylstyrene, camphor, dihydrocarvone, carvotanacetone, octadecane, nonadecane, α,α,β-trimethylbenzyl alcohol, eicosane and apiol in root essential oil by GLC; dillapional isolated from seed oil and characterised; Z-ligustilide, neocnidilide, butylphthalide and senkyunolide identified in roots; synthesis of carvone.

New Compounds



Dillapional

Action

Casminative, stomachic, aromatic, stimulant, diuretic, resolvent, emmenagogue and galactagogue. Dill water prepared from the fruit (seed) is regarded as stimulant, carminative and aromatic; and like anise, popularly supposed to promote the secretion of milk.

The fruits, sometimes the flowering stems, are used medicinally. Among the constituents are an essential oil (dill seed oil) with carvone and limonene as its main components, fatty oil, proteins, tannins and mucilage. Dill is a good carminative, stomachic and tranquillizer. It is also a galactagogue-it promotes milk flow in nursing mothers. Dill is safe for children and dill–or gripe–water, which is made from the fruits, is given to babies for hiccups, to relieve colic and to induce sleep. The essential oil obtained by distillation is used in the pharmaceutical industry, in the manufacture of liqueurs and in cosmetic preparations. Besides its use in the kitchen Dill is also extensively used as a flavouring agent by the food industry, especially on the Continent.

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Uses

Essential oil contained in the fruit and the *distilled* water of the fruit are much used in flatulence, hiccup, colic and abdominal pain in children and in adults. It may be combined with sodium bicarbonate or a little of lime water in hiccup and flatulence. It is used to diminish the griping of purgatives, and the tormina of dysentery. An *infusion* of the bruised fruits or seeds (1 in 30) is also very useful. Of this when strained and cold, the dose for an infant is 2 drachms or more sweetened with a little sugar. It is also given as a drink to women after confinement. With *methi* the seeds are fried in butter and used to check diarrhoea. *Seeds* bruised and boiled in water and mixed with the *roots* are applied externally in rheumatic and other swellings of the joints. *Seeds* are used as a worm remedy; also for colic, especially in horses. Among Indian drugs, dill seed keeps a prominent place as a stomachic medicine, especially in the ailments of children and women. *Leaves* are moistened with a little oil and warmed and applied to boils and abscesses to hasten suppuration. *Leaves* are also cooked, as a pot-herb, alone with other vegetables. The strong flavour of the leaves is disliked by many.

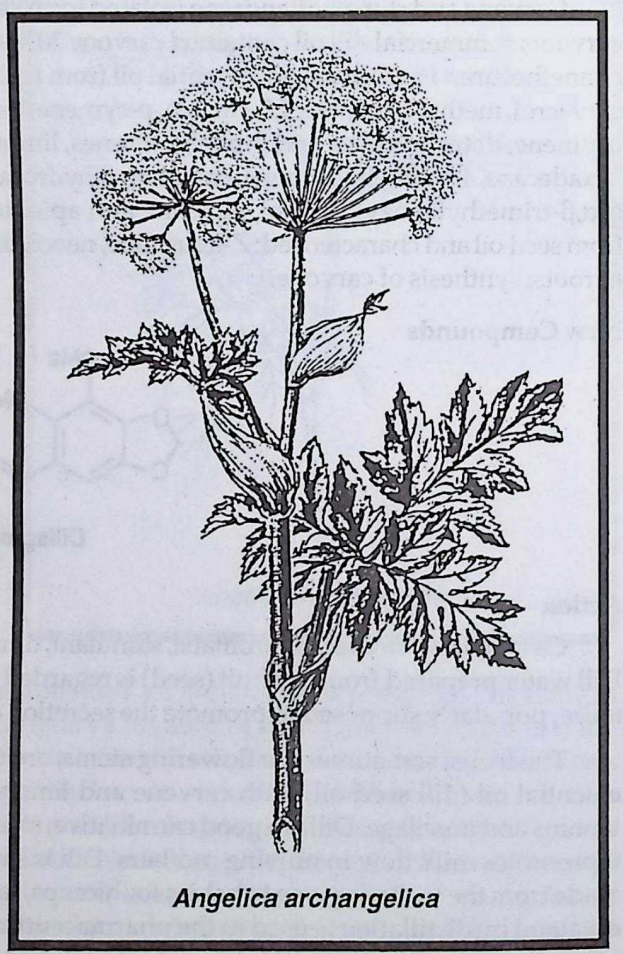
Angelica archangelica
(Family: Umbelliferae)

Vernacular Name

Eng.–Garden Ange.

Botanical Description

A biennial herb of robust habit with a dark turnip-like rhizome and stout roots, which bear, in the first year, a basal rosette of leaves and, in the second year, a tall, much-branched, furrowed, hollow, leafy, green stem. The large leaves are alternate, serrate and finely divided (two or three times pinnate), and have inflated sheathing petioles. The greenish flowers are arranged in compound terminal umbels. The fruit, a double achene, is oval, flattened with thin wings at the edges, and ribbed. All parts of the plant are aromatic. It is an excellent source of food for bees.



Angelica archangelica

Habitat

Garden Angelica is widely distributed throughout Europe and Asia, especially in more northerly regions and at higher altitudes. It is a common garden plant and is cultivated commercially in several countries for medicinal and perfumery purposes and for the leaf stalks, which are preserved in sugar and used in confectionery or as a flavouring for herbal liqueurs. Garden Angelica is not native to the British Isles but it has become naturalized on river banks and waste ground and can be locally abundant. Wild Angelica (*A. sylvestris*), which is a native British plant, is much commoner. Its leaf stalks can also be candied.

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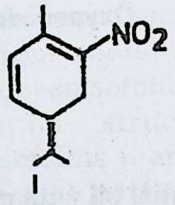
These plants used to be called *herba angelica* (angel's plant) because they were thought to have heavenly powers against diseases. The Latin word *angelica* came originally from the Greek *angelos* (= a messenger).

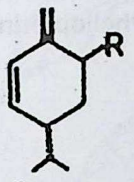
Constituents

2-Nitro-1,5-p-menthadiene (I), trans- and cis-6-nitro-1(7),2-p-menthadiene (II,III), trans-1(7),5-p-menthadien-2-yl acetate (IV) and 7-isopropyl-5-methyl-5-bicyclo[2.2.2]octen-2-one (V) identified in root oil and also synthesised; root oil (0.0005%) constituted of α- and β-pinenes, camphene, car-3-ene, α- and β-phellandrenes, limonene, o- and p-cymenes, γ-terpinene, terpinolene, fenchone, linalool, terpineol, bisabolene, borneol, β-caryophyllene and bisabolol; detection of α-pinene (11.4), camphene (0.6), β-phellandrene (2.1), p-cymene (1.4), β-caryophyllene (2.4), β-bisabolene (1.5), a mixture of coumarins (18.1), bergapten (19.6), oxypeucedanin (2.6) and hexyl methylphthalate (36.0%) in seed oil (0.4%) by GLC; α- and β-phellandrenes, α-pinene, myrcene, camphene, β-pinene and α-terpinene isolated from fruits; β-cyclolavandulyloxypsoralen isolated; detection of β-caryophylline and terpenes in essential oil; dihyrofuranocoumarin glycosides (VI, VII) isolated from roots and characterised.

New Compounds



I



II

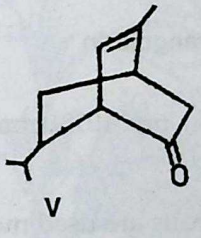
R = α-NO_2

III

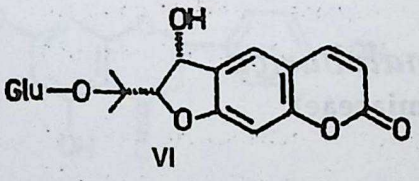
R = β-NO_2

IV

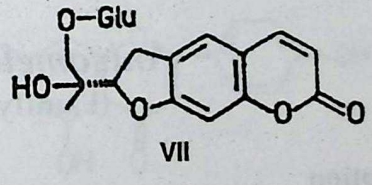
R = β-OAc



V



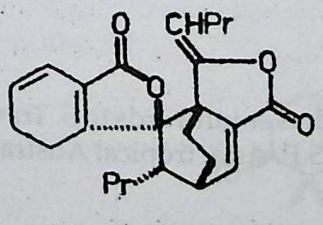
VI



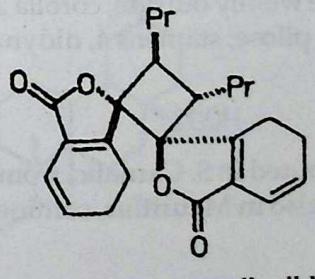
VII

New lactone–angeolide–isolated and its structure elucidated isolation and characterisation of angeliocolide from roots.

New Compounds



Angeolide



Angelicolide

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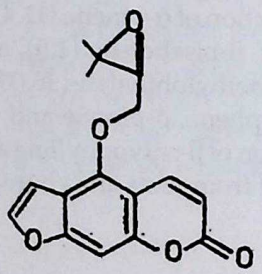
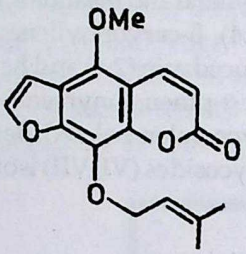
Furocoumarins–angelican, mp. 139°, prangolarin, mp. 104°, archangelin, mp. 132°–a phenolic compound–angelicain, mp. 194°–and a flavanoid–archangelicain, mp. 129°–from roots; phellopterin from fruit identified as 4-methoxy-7-(γ,γ-dimethylallyloxy)-psoralen by degradation and synthesis; umbelliprenin, isoimperatorin, bergapten, prangolarin, ostruthol and oxypeucedanin hydrate from seeds; archangelin, prangolarin, angelicain, ostruthol, mp. 138° and oxypeucedanin hydrate, mp. 134°, from roots.

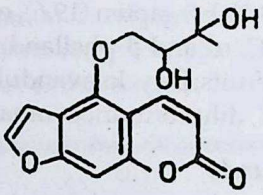
New Compounds



(R) Prangolarin



Phellopterin



Oxypeucedanin hydrate

A lactone (0.06%), mp. 101°, from fruits.

Uses

The roots and fruits are used medicinally. They contain an essential oil with phellandrene and limonene as the main components, also coumarin glycosides, organic acids, bitter compounds, tannins and sugars. These constituents give Garden Angelica tonic, carminative, stomachic and antispasmodic actions. It is used internally in particular for loss of appetite, flatulence and bronchial catarrh. Externally it is used in both preparations for exhaustion and rheumatic pain, and in gargles. The distilled oil (angelica seed oil) is used in perfumery.

Anisomeles malabarica

(Family: Lamiaceae)

Botanical Description

Aromatic sub-shrub; stem and branches softly white tomentose and obtusely tetragonous; leaves simple, opposite, thick, lanceolate-acute, 12.5 × 3.5 cms, margin serrate, scented, pale green above, white tomentose below; flowers pale purple in terminal whorls of short, densely wooly spikes; calyx 5, gamosepalous, white woolly outside; corolla 2-lipped, upper lip short, white vilous without, lower lip spreading, 3-lobed, pilose; stamens 4, didynamous, exserted; ovary 4-partite, style slender, bifid; fruit of 4 nutlets.

Habitat

The plant is distributed in S. Carnatic, from Madras southwards to S. Travancore, West to the E. foot of the ghats. And also in Mauritius, continental S.E. Asia, tropical Australia and Malasia.

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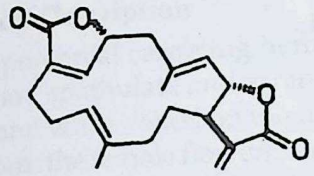
Constituents

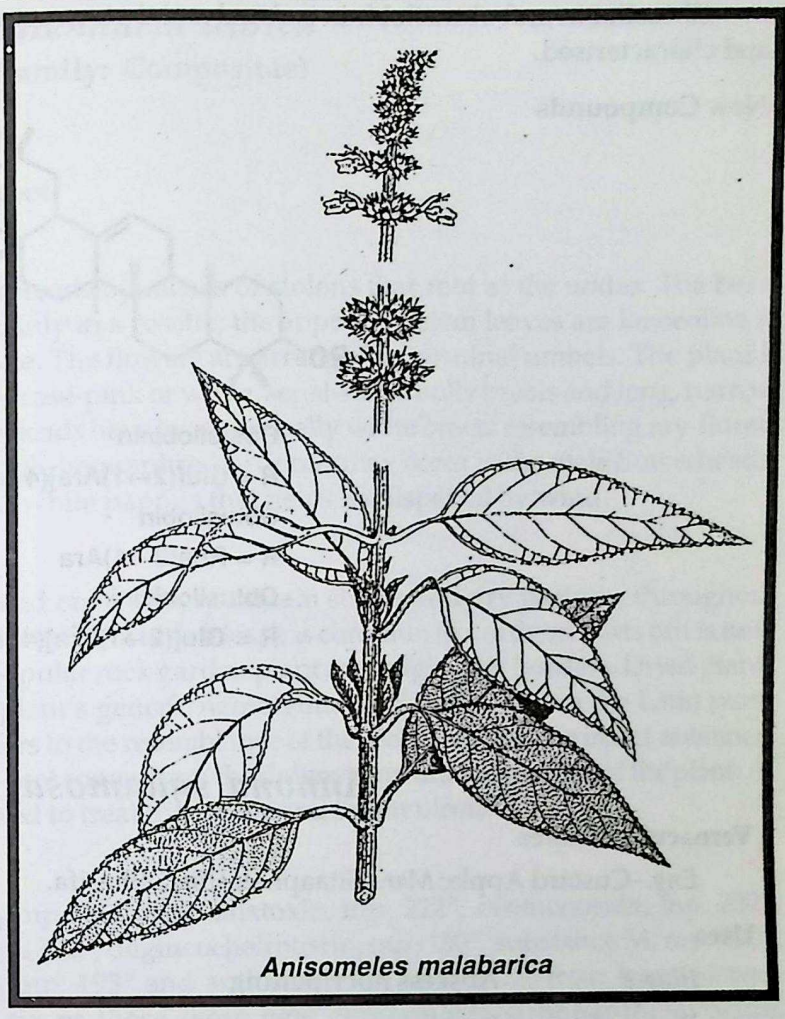
A macrocyclic diterpene–ovatodiolide, mp. 148°–isolated from leaves and its structure revised.

New Compounds



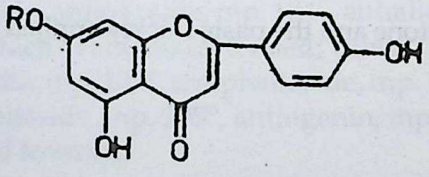
Ovatodiolide

Ovatodiolide, anisomelic acid, anisomelin, tetracosane, tetracosanol, β-amyrin, friedelin and betulonic acid isolated from roots; new acylated glucoside–anisofolin A–isolated and its structure determined; anisofolins B and C isolated from aerial parts and characterised; 5-hydroxy-3′,4′,6,7-tetramethylflavone, anisomelin and apigenin from aerial parts; isolation of 5,6-dimethoxy-7,3′,4′-trihydroxy-flavone from aerial parts.

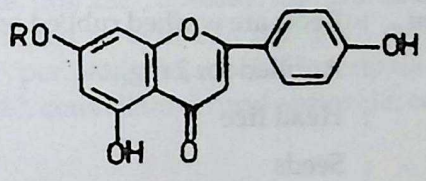


Anisomeles malabarica

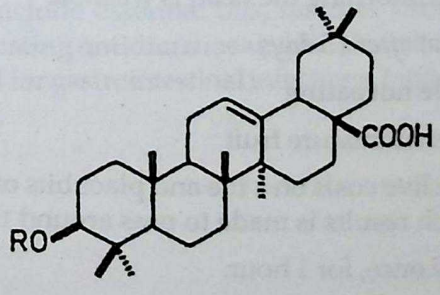
New Compounds



Anisofolin A
R = Glu(3'',6'' -di-O-p-coumaroyl)



Anisofolin B
R = Glu(2'',6'' -di-O-p-coumaroyl)



Narcissifloridine
R = Glu(4→1)Rha(2→1)Ara

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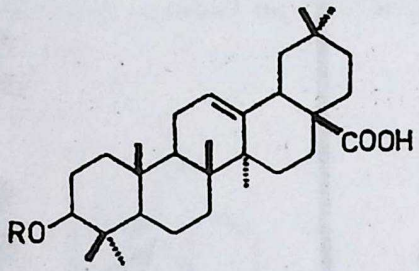
Obtusilobin and obtusilobinin isolated and their structures elucidated, obtusilobicinin isolated and characterised.

New Compounds



Obtusilobinin
R = Glu[(2→1)Ara](4→1)Rha
Obtusilobin
R = Rha(2→1)Ara
Obtusilobicinin
R = Glu[(2→1)Ara](4→1)Rha(2→1)Ara

Annona squamosa, Linn.

Vernacular Names

Eng.–Custard Apple; *Mar.*–Sitaaphal; *Hind.*–Sharifa.

Uses

Illness : **Abscess not ripening**
Part used : Roots
Preparation : Roots are washed rubbed on a stone and the paste thickly applied on the abscess.
Dosage : Applied for 2 nights
Illness : **Head lice**
Part used : Seeds
Preparation : The seeds are ground fine, the powder put in water to make a paste.
Use : At bedtime this paste is applied to scalp and a cloth wrapped around the head. In the morning the head is washed.
Dosage : *Repeat after 15 days.*
Illness : **Cattle not eating**
Part used : Fallen immature fruit
Preparation : Take live coals on a tile and place bits of the immature fruit on them. The smoke which results is made to pass around the animal's mouth.
Dosage : Only once, for 1 hour.

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Antennaria dioica
(Family: Compositae)

Vernacular Names

Eng.–Mountain Everlasting, cat's foot.

Botanical Description

A perennial carpeting herb that spreads by means of stolons that root at the nodes. The basal leaves are spathulate and arranged mainly in a rosette; the appressed stem leaves are lanceolate to linear and white-felted on the underside. The flowers are arranged in terminal umbels. The plant is dioecious: the female flowerheads have rose-pink or white, sepal-like woolly bracts and long, narrow tubular florets; the smaller male flowerheads have broad, usually white bracts resembling ray-florets and spreading tubular florets. Some sterile hermaphrodite florets may occur in the male flowerheads. The fruit, an achene, is crowned with a white pappus that helps its dispersal by wind.

Habitat

Mountain Everlasting is widespread on heaths, mountain slopes and dry pastures throughout central and northern Europe. It is native to the British Isles; it is common in northern parts but is now very rare in southern England. It is a popular rock garden plant and edging for borders. Dried plants are used for winter decorations. The plant's generic name, *Antennaria*, comes from the Latin word *antenna* (= a feeler) and supposedly refers to the resemblance of the seed parachute to insect antennae. The alternative common name of Cat's-foot comes from the downy appearance and feel of the plant. At one time Mountain Everlasting was used to treat dysentery and tuberculosis.

Constituents

α-Antiarin, mp. 243°, β-antiarin, mp. 245°, convallatoxin, mp. 222°, evomonoside, mp. 232°, malayoside, mp. 220°, substance E, mp. 272°, deglucocheirotoxin, mp. 180°, substance M, mp. 220°, convallatoxol, mp. 212°, α-antioside, mp. 193° and antioside, mp. 183°/222°, from latex; sixteen cardenolides isolated from seeds, six of these were new compounds–strophanthojavoside, antiarojavoside, antiogoside, mp. 184°, antialloside, mp. 227°, uposide, mp. 175° and antiosemoside, mp. 190°–which were characterised; others identified as cymarin, mp. 131°, cymarol, mp. 213°, strophanthidin, mp. 139°, strophalloside, mp. 177°, periplogenin, mp. 225°, peripallopside, mp. 162°, periplorhamnoside, mp. 205°, antiogenin, mp. 258°, convallatoxin and antioside; convalloside, mp. 241°, isolated from sap.

Uses

The flowerheads are used medicinally. The coloured flowers have a stronger action than the white ones and they are separated from the others before drying. The dried herb has a pleasant aroma and a bitter taste. The constituents include essential oils, tannins, bitter compounds and organic pigments which give Mountain Everlasting antidiarrhoeal, mild diuretic, expectorant and choleretic properties. In herbal medicine it is used for gastrointestinal infections, bilious conditions and bronchitis. It is also an ingredient of tea mixtures.

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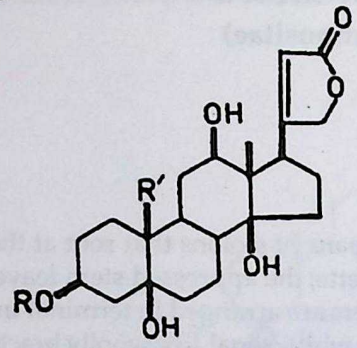
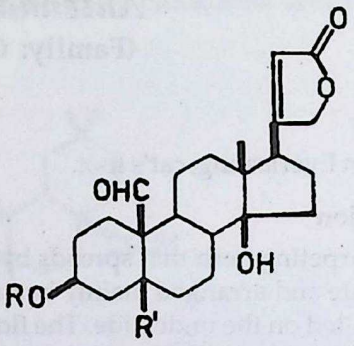
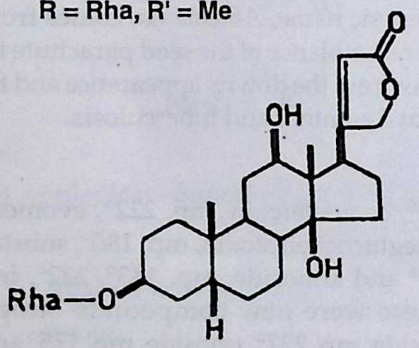
New Compounds



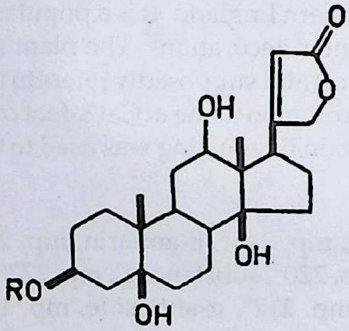
Antialloside
R = 6-Deoxyllose, R' = CHO
Antiarojavoside
R = Javose, R' = CHO
α-Antioside
R = Gulomethylose, R' = Me
Antioside
R = Rha, R' = Me



Malayoside
R = Rha, R' = H
Strophanthojavoside
R = Javose, R' = OH



Substance E



Antiogoside
R = 6-Deoxyallose

Anthemis nobilis, Linn.

(Family: *Compositae*)

Vernacular Names

Eng.–Chamomile, Camphor-plant (odour of the flowers being like, that of camphor); *Hind. & Ben.*–Babunike-phul; *Pers.*–Babunah; *Arab.*–Babunj, Babunaj, Shajrat-ol-kafur; *Mah.*–Babuna; *Tam.*–Shimedapu, Shimai-chamantipu; *Mal.*–Shima-jevanti-pushpam; *Tel.*–Simachamauli pushpamu, Sima-chamanti-pushpam; *Can.*–Shime-shavantige.

Botanical Description

A perennial herb with a short, much-branched creeping rhizome, low-growing, creeping or ascending hairy stems and alternate, finely divided (two or three times pinnate) leaves with inrolled

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margins. The terminal solitary flowerheads have conical, solid receptacles and either white, ligulate ray-florets and yellow, tubular disc-florets or, in the case of cultivated double forms, only ligulate florets (these are most in demand for medicinal purposes). The receptacle bears chaffy scales between the florets. The flowerheads are ringed by green bracts with white papery tips. The fruit is a laterally flattened achene.

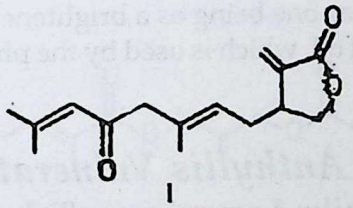
Habitat

Native of Europe and Persia; but cultivated in India chiefly in the Punjab. Dried flowers are available in all the bazaars. Chamomile grows wild in southern parts of the British Isles where it has a local distribution in pastures and other grassy places on sandy soils. It was once widely cultivated for medicinal purposes and for lawns and is sometimes found elsewhere in Britain as a garden escape. It is now commercially grown on the Continent but only on a small scale in Britain. The flowers smell of apples and its generic name, *Chamaemelum*, which is derived from the Greek word *khamaimelon*, means 'earth apple'. The medicinal properties of Chamomile were known to the ancient Egyptians who dedicated the herb to their gods. The plant remains a favourite herbal remedy, especially in the form of Chamomile tea.

Constituents

An optically active sesquiterpene lactone (I) isolated.

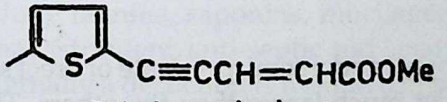
New Compounds



I

Trideca-1,3,5-triene-7,9,11-triyne (I), Irans-dehydromatricaria ester, mp. 49°, and its cis-isomer isolated from roots; a sesquiterpene lactone–nobilin, mp. 177°–from flowers.

New Compounds



Dehydromatricaria ester

$$Me(C{\equiv}C)_3CH{=}CHCH{=}CHCH{=}CH_2$$

I

A volatile essential oil, anthemene 1 p.c., anthemic acid, a bitter extractive pinciple, tannin, resin, malates and tannates. Oil consists of (1) angelic and tiglic esters of isobutyl, anyl and hexyalcohols; (2) an alcohol anthemol and anthemene–a hydrocarbon.

Parts Used

Dried-flower-heads and oil.

Action

Te volatile oil has the power of lowering reflex excitability and therefore useful in nervous diseases of women. It generally acts as stomachinc, tonic, carminative, emmenagogue, anti-periodic, vermifuge

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and insecticide. The *essential oil* has anti-spasmodic properties in does of 1 to 3 minims. "Flowers are stimulant, tonic and carminative."

Preparation

Infusion, Paste, Oil and Extract, solid and fluid.

Uses

Properties of this drug are same as Matricaria chamomilla. *Chamomile* is useful in dyspepsia and general debility in doses of 10 to 30 grains. *Warm infusion of flowers* is carminative, and is used an anthelmintic for children; in large does is sometimes used to promote the emetic action; it is useful in hysteria and dysmenorrhoea. It is also given in flatulent, colic, dyspepsia, chlorosis, etc. *Cold infusion* is given in indigestion and summer diarrhoea in half to one ounce doses. *Externally* an infusion or decoction or *cataplasm* of the flowers is used to relieve pain. Its odour is destructive to gnats and itch insects and hence the flowers are used as insecticide. The dose of solid extract is 2 to 10 grains and of fluid extract is 30 to 60 minims.

The flowerheads are used medicinally. Their constituents include an essential oil with azulenc that turns blue on distillation, bitter compounds, fiavonoid glycosides and choline. They have anti-inflammatory, antiseptic, antispasmodic, mild sedative, stomachic and diaphoretic properties. In herbal medicine an infusion is used for fever, dyspepsia, nausea, painful menstruation and insomnia. Used externally as a strong infusion Chamomile is also effective in treating ulcers, eczema and wounds. It has many cosmetic uses, a popular one being as a brightener of fair hair. Distillation of the fresh flowering stems yields the essential oil, which is used by the pharmaceutical industry.

Anthyllis Vulnerat

(Family: Leguminosae/Fabaceae)

Vernacular Name

Eng.–Kidney Vetch.

Botanical Description

A perennial herb with a taproot and a semi-prostrate or erect stem. The alternate leaves are odd-pinnate, with the terminal leaflet much larger than the others. The basal leaves are arranged in a rosette and may be undivided. The usually yellow flowers are clustered in one or two dense terminal cymes. The calyx is woolly; the petals are larger than the calyx and claw-shaped. The fruit, a one-seeded pod, is semicircular, flattened and criss-cross patterned; the seed is kidney-shaped. Apart from the fruit all parts of the plant are softly hairy.

Habitat

Kidney Vetch is common throughout Europe in dry grassy places on lime-rich and sandy soils, particularly near the sea. It occurs throughout the British Isles. It is also grown for fodder either on its own or mixed with other grassland plants. The generic name, *Anthyllis*, is derived from the Greek words *anthos* (= a flower) and *ioulos* (= down); the specific name, *vulneraria*, from the Latin *vulmus* (= a wound) refers to the traditional use of the plant for healing wounds. The plant was also used against kidney troubles, hence the common name (the flowers look like kidneys and by association they were held to be a good kidney remedy). The word 'vetch' is a corruption of the Latin name *vicia* for beans.

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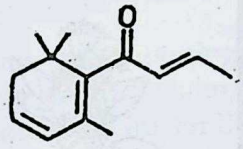
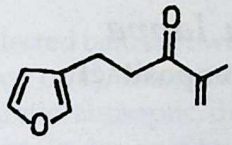
Constituents

Identification of 5-isopropyl-2-propyl-2-cyclohexen-1-one and 5-isopropyl-2-(2-methylpropyl)-2-cyclohexen-1-one in oil and their syntheses; β-damascenone, 5-(3-furyl)-2-methyl-1-penten-3-one (I). (E)-1-(2,6-dimethylphenyl)-2-buten-1-one and 4- isopropenylbenzaldehyde identified by GC in Roman chamomile oil; three novel diesters (II-IV) isolated from oil and characterised; 2-hydroxy-2-methyl-3-butenyl, 3-hydroxy-2-methyl-idenebutyl and 3-methylidene-4-oxopentyl esters of angelic acid identified in Roman chamomile oil.

New Compounds



β-Damascenone



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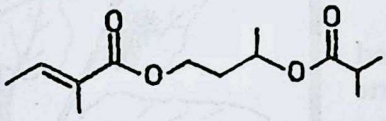
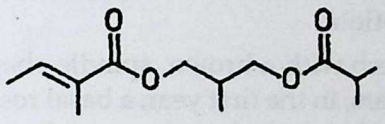
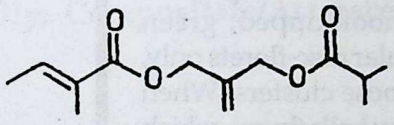


II



III



IV

Uses

The flowers are used medicinally but old ones are not dried because they turn brown and disintegrate. The constituents include tannins, saponins, mucilage, sugars and organic pigments (flavonoids), and these give the plant astringent, anti-septic and laxative actions. An infusion is used in herbalism as a general tonic; externally a decoction is used in compresses or bath preparations for treating inflamed wounds, ulcers and eczema, and in gargles and mouth washes. It can be used as a substitute for ordinary tea mixed with the leaves of Wild Strawberry (*Fragaria vesca*) and Raspberry (*Rubus idaeus*) and the flowers of Blackthorn (*Prunus spinosa*).

Apluda mutica, Linn.

Vernacular Names

Bh.–Tilkhoda; *Mar.*–Ponai.

Illness : **Uncontrolled bleeding**

Part used : Leaves

Preparation and use : The leaves are crushed in the hand and bandaged on.

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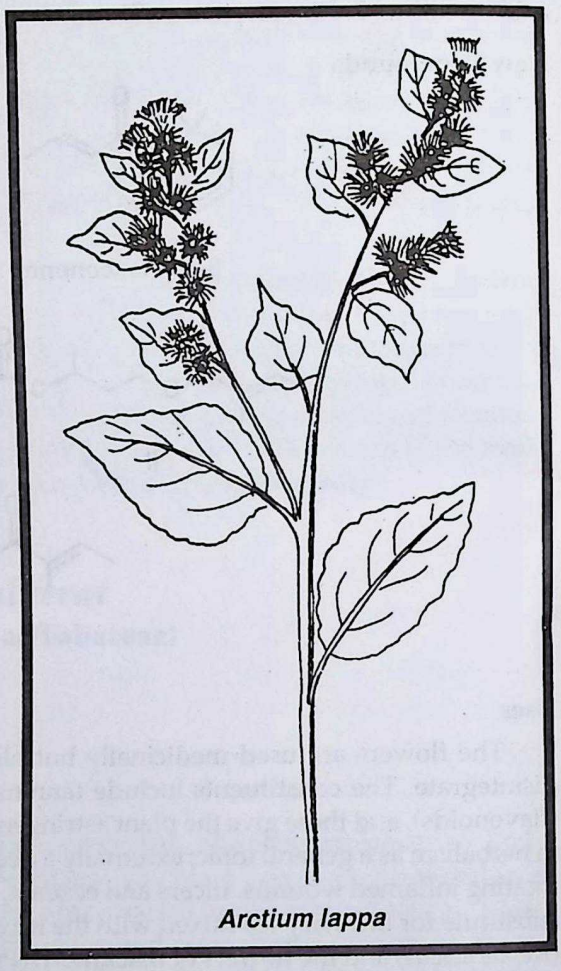
Illness : **Wounds not healing**

Part used : Dry leaves

Preparation : Dry leaves are crushed in the hand to make a powder and this is sprinkled on the wound.

Dosage : Once a day, up to three days.

Arctium lappa
(Family: Compositae)


Arctium lappa

Vernacular Name

Eng.–Greater Burdock.

Botanical Description

A biennial herb with a brown, spindle-shaped taproot, which bears, in the first year, a basal rosette of ovate to cordate leaves and, in the second year, a tall, angled stem with alternate leaves. The globose flowerheads, with numerous hook-tipped, green involucral bracts and purple tubular disc-florets only, are arranged in terminal corymbose clusters. When mature the flowerheads from spiny balls (burs), which are dispersed by sticking to the bodies of animals or to clothing. The fruit, an achene, has a pappus of short, rough hairs.

Habitat

Greater Burdock is found throughout Europe commonly near buildings, in waste places, waysides and thickets on heavy soils. In the British Isles it mostly occus in lowland parts of southern England, in the Midlands and Wales. The generic name, *Arctium*, from the Greek word *arktos* (= bear), alludes to the thistle-like fruit heads, as do the specific name *lappa* and the common name Burdock. Greater Burdock has had many medicinal uses in the past. It is still regarded as herbalists as one of the best blood purifiers. In some countries it is grown commercially for its roots. The related Woolly Burdock (*A. tomentosum*) and Lesser Burdock (*A. minus*) have similar medicinal properties.

Constituents

A tumor growth-inhibiting mixture isolated from root; polyacetylene mixture consisted of 1,11-tridecadien-3, 5,7,9-tetrayne (I) and 1,3,11-tridecatrien-5,7,9-triyne (II) (50%), both compounds bacteriostatic and fungistatic.

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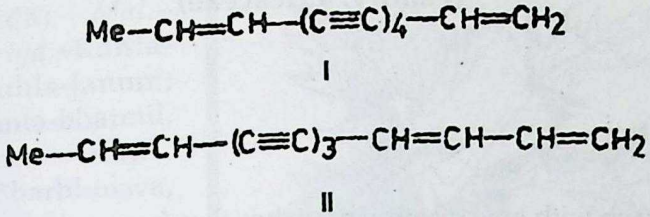
New Compounds



I

II

Uses

The roots of one-year or overwintering plants, collected before flowering, are used medicinally. The constituents include a starch (insulin, 27 to 45 per cent), traces of an essential oil, mucilage, tannins and resin, and these give Greater Burdock diuretic, antiseptic, diaphoretic, hypo-glycaemic and choleretic properties. It is used in herbal medicine on its own or in tea mixtures for influenza and rheumatic pain. A decoction is used externally for bathing wounds, ulcers and eczema and the oil extract continues its traditional use (though the effect is not proven) as a stimulant of hair growth.

Arctium tomentosum

(Family: Compositate/Asteraceae)

Vernacular Name

Eng.–Woolly Burdo.

Botanical Description

A biennial herb with a spindle-shaped taproot and branched, furrowed stem. The leaves are ovate to cordate, stalked and white woolly below, the large basal ones forming a rosette. The globose purple flowerheads, which are covered by a 'web' of dense cobweb-like hairs, are clustered in terminal corymbs. The rings of hooked involucral bracts turn the flowerhead into a bur when it is mature. The fruit, an achene, has a pappus of short, rough hairs.

Habitat

Woolly Burdock grows throughout most of Europe by roadsides and on waste ground. It is not native to the British Isles but it is occasionally found as a casual in woods and scrub. Like Greater Burdock (*A. lappa*), this species has had many medicinal uses in the past. The young stalks also used to be eaten raw or cooked. The specific name *tomentosum* means woolly or downy. In the common name the suffix 'dock' refers to the large leaves, which are like those of docks (*Rumex*).

Uses

The roots of one-year or overwintering plants, collected before flowering, are used medicinally. The pharmacological investigation of burdocks is not yet complete, but the chemical composition of Woolly Burdock seems to be the same as Greater Burdock's-both contain a large amount of inulin. The presence of insulin-a polysaccharide composed of units of fructose-gives burdocks hypoglycaemic properties. Woolly Burdock is mostly used in herbalism to treat skin diseases and as a hair oil. Sometimes the fresh leaves, fresh root or just the juice from the root are used-they promote bile secretion, urine flow and sweating.

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Arctostaphylos uva ursi, Spreng.
(Family: Ericaceae)

Vernacular Name

Eng.–Bearberry.

Botanical Description

A low evergreen shrub with long, rooting branches that form a dense mat. The branches have many small, oval, entire, leathery leaves that are dark green on the upper surface, paler and distinctly net-veined, and broadest at the tip. Bearberry leaves can easily be distinguished from those of Bilberry (*Vaccinium myrtillus*) and Cowberry (*Vaccinium vitis-idaea*). Bilberry's leaves are oval, bright green and finely serrate; Cowberry's are oval, broadest in the middle, entire and the margins are rolled inwards. The small white or pink-tipped flowers are arranged in short dense racemes. The edible fruit is a shiny-red, globose drupe with five seeds inside.

Habitat

Bearberry grows in acid soil on moors, screes and mountain scrub in northern parts of Britain and in northern and western parts of Ireland. It is more common in the Scottish Highlands than elsewhere. It is also found throughout most of Europe. In some countries, however, it has become very rare and is now protected. Bears are said to enjoy the fruit of some bearberry species, hence the common name and the generic name (from the Greek words *arktos* = a bear and *staphyle* = grapes). Bearberry has long been used as a medicinal plant, especially for kidney and bladder problems and today some of its constituents are included in proprietary medicines.

Constituents

Three arbutin galloyl esters isolated and their structures established.

Uses

The leaves are used medicinally. Among the constituents are up to 12 per cent glycosides (arbutin and methylarbutin), tannins and organic acids. An infusion of Bearberry is used in herbal medicine as an antiseptic and diuretic for gravel and uroliths and for infections of the urinary tract and kidneys, but *only if the urine is alkaline. Bearberry should be taken internally only under the supervision of a qualified medical or herbal practitioner.* If used for long periods it may cause constipation, nausea or more serious side-effects.

Argemone mexicana, Linn.
(Family: Papaveraceae)

Vernacular Names

Sans.–Swana Kshiri, Srigalakantaka, Haimavathi; *Eng.*–Yellow thistle, Prickly or Mexican poppy; *Hind.*–Pila-dhatura, Firanghee-dhatura, Ujar-kanta, Bharband, Kutila, Sitlkanta; *Ben.*–Shialkanta, Shealkanta, Baro-shialkanta; *Guj.*–Darudi; *Duk.*–Daruri, Feringee-datura; *Mah.*–Kanta-dhotra; *Tel.*–Brahmdandi chettu, Datturi, Pichy, Chettu; *Tam.*–Kudiyotti, Biramadandu, Brahmmadandu, Kurukkum-

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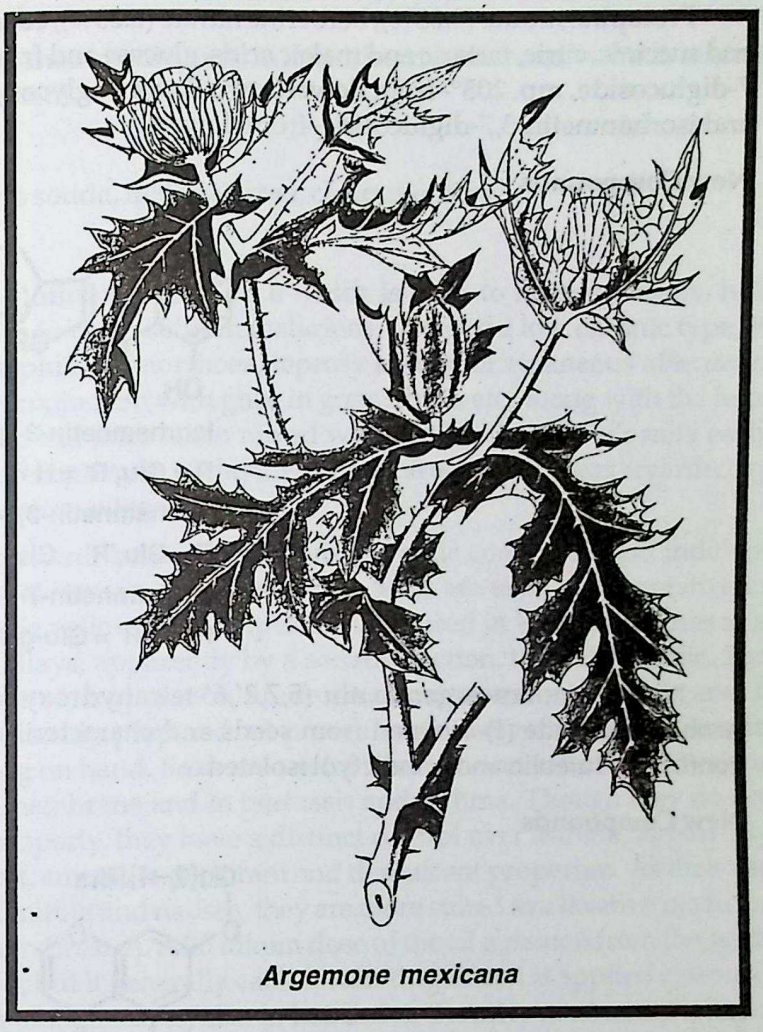
chedi, *Can.*–Arasina-ummatta, Arsha unmatta, Datturi-gida; *Mal.*–Ponnummattum; *Uriya.*–Kanta-kusham; *Santal.*–Gokuhla-janum; *Punj.*–Kandiari, Sial-kanta-bhatmil, Satyanasa, Bherband, Katci, Bhatkateya; *N.W.F.P.*–Bharbhurwa, Karwa-kantela.



Argemone mexicana

Habitat

Common everywhere by road-sides and fields in India, especially from Bengal to the Punjab, and in Simla 5000 feet, (originally brought from Mexico) and appearing in the cold season.

Parts Used

Milky juice of the fresh plant, seeds, and a mixed oil of fresh seeds and fresh root.

Constituents

Leaves and capsules are said to contain an alkaloid resembling morphia. Later investigations, however, showed that it contained *berberine* and *protopine* but no morphine or argemonine as was reported by some workers. Seeds yield about 22% of an oil argemone oil. This oil contains upto 40 per cent free glycerides of fatty acids. Some crushed seeds were steam-distilled; the distillate had a slight opalescence and a very pungent odour, but no oil came over. Extraction of the crushed seeds with petroleum-ether gave 22.3% of a pale greenish yellow oil with a green flourescence. The oil obtained by pressing the crushed seeds was deep brown, mild odour, tasteless d28 0.9117, d100 0.9007, n32D 43034, sapon. no. 185.5, acetyl no. 27.9, acid no. 146; I. no. 106.7. R.M. no. 0.61, Hehner no. 94.02, glycerol 15.48%. Maumene test 65°. The oil very thin at first, gradually, thickens on keeping. AcOH and valeric acid are present. The mixed fatty acids, pale in colour and thin, showed: d280.9065, d1000.8889, Sapone no. 194. I no. 147.4, temperatue of turbidity 22°; contains 8.14% of lauric acid; no stearic acid is presents. Seeds yield about 22% of an oil, carbohydrates and albumen 49 per cent, moisture 9 per cent, and ash 6 per cent. Seeds when incinerated yield ash containing alkaline phosphates and sulphates. Dragendorff stated that the seeds contained an alkaloid which agrees with morphine in all its important reactions, but this statement in not borne out by recent studies. The plant contains large quantities of a yellow juice resembling that from gamboge containing small quantities of berberine. Potassium Nitrate was identified among the salts naturally existing in the plant.

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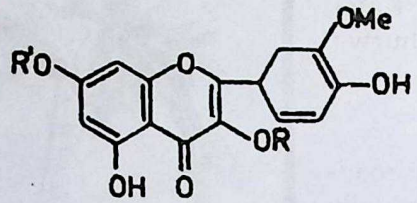
Protopine nitrate (0.03%), berberine nitrate (0.05%), ceryl alcohol, β-sitosterol, an alcohol, mp. 73° and succinic, citric, tartaric and maleic acids, glucose and fructose, isolated; a flavonoid–isorhamnetin-7-diglucoside, mp. 208°–from flowers; two flavonol glycosides–isorhamnetin-3-glucoside, mp. 135° and isorhamnetin-3,7-diglucoside–from flowers.

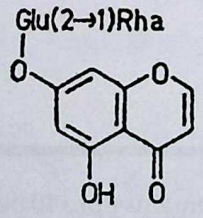
New Compounds



Isorhamnetin-3-glucoside
R = Glu, R' = H
Isorhamnetin-3,7-diglucoside
R = Glu, R' = Glu
Isorhamnetin-7-diglucoside
R= H, R' = Glu-glu

New phenolics–argemexitin (5,7,2',6'-tetrahydroxyflavone) and 5,7-dihydroxychromone-7-neohesperidoside (I)–isolated from seeds and characterised; presence of argemexitin in seeds not confirmed; luteolin and eriodictyol isolated.

New Compounds



I

Biological Activity

Effect of sanguinarine, a $Na^+ K^+$ -ATPase inhibitor, on refractory period of porcine ventricle was studied. Sanguinarine (4.0 mg/kg) markedly increased ventricular refractory period and also increased stimuls threshold of ventricle. Sanguinarine, thus, prolonged ventricular refractoriness and this property may be useful in treatment of ventricular arrhythmias.

Action

Juice of diuretic, alterative, anodyne and hypnotic. Seeds are laxative, nauseant, emetic, expectorant, demulscent and narcotico-acid. Oil is a powerful alterative. Oil from the seeds is a drastic purgative, nauseant, expectorant, aperient and sedative, combining the action of the castor-oil and cannabis indica; fresh root has an anodyne effect.

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Action and Uses in Ayurveda and Siddha

Tiktarasam, pitta kapha haram, rechanam, bedhanam, in krimi, kandu, anaham, visham, raktam, kustam, in disease of eye and for prameham.

Action and Uses in Unani

Hot 1°, Dry 1°, blood purifier, expels souda, malarial fever, clears memory.

Uses

Whole plant abounds in a yellow glutinous milky juice which is used to relieve blisters, heal excoriations and indolent ulcers. (Watt). *Juice* is useful in malarious fevers of a low chronic type, in dropsy, jaundice and as alterative in syphilis, gonorrhoea, leprosy and other cutaneous affections, including scabies; also administered in conjuction with ghee in gonorrhoea etc., along with the juice of Aristolochia bracteata; one tola of the leaf juice taken mixed with one *kudtha* of cow's milk early morning on empty stomach is said to cure leprosy in 40 days. An infusion of the juice was regarded by early physicians as a diuretic and was fairly extensively used.

Externally, leaf juice relieves blisters and heals excoriations, herpetic conditions and indolent ulcers. *Care should be taken that it may not come in contact with eyes. Seeds* are used as a purgative in syphilis. Seed, yield on expression a pale yellow clear limpid fixed oil used in ½ drachm doses as a gentle aperient, and at the same time allays, apparently by a sedative action, the pain in colic. The smallness of the doses, and the mildness of its operation, are recommendations for its employment. Age apparently, affects its action, the freshly prepared oil proves more energetic and uniform in operation than that which has been long on hand. *Seeds* are useful in cough and catarrhal affections of the throat and pulmonary mucous membrane and in pertussis and asthma. Though they do not appear to possess any antipasmodic property, they have a distinct control over asthma, apparently from their combined actions of nauseant, emetic, expectorant and demulcent properties. As their use is often accompanied by more or less vomiting and nausea, they are more suited as a laxative medicine to some pulmonary affections than other diseases. A 30 minim dose of the *oil* obtained from the seeds acts as cathartic; it is best given in sugar; but it generally causes vomiting also; it is applied *externally* to ulcers, herpatic eruptions and other skin diseases; also in headache; the oil is used as a powerful alterative in syphills and leprosy, and as an antidote to snake-poison. Early European physicians in India used the seeds and seed oil as a remedy for dysentery and other intestinal affections. There has been much difference the opinion regarding the aperient action of the oil but some authorities assert that the oil in doses of 30 to 60 minims is a valuable remedy. *Seeds* and *oils* have a beneficient effect in asthma which they control; the largest dose of the seeds is 2½ drachms always used in *emulsion* which can be sweetened if necessary; of the oil 30 to 40 minims is the highest dose. The *oils* is serviceable in some cases in which *jalap*, rhubarb and castor-oil are indicated, and also in some bronchial and catarrhal affections. *The oils is unsafe in more than 40-minim doses and produces a dangerous bypercatharsis when the dose in increased to 1 drachm.* If the oil is fresh, its average dose is 25 minims; and if old, 35 minims. It is a good drastic or hydrogogue cathartic in such doses, and generally produces from 5 to 12 motions. Its advantages over jalap, rhubarb, castor-oil, etc., is the smallness of its doses; and over the croton oil its freeness from unpleasant, nauseous an acrid taste. Its disadvantages as a purgative are, firstly, that its action is not uniform even in its average dose which produces more than 15 to 16 motions at one time, and only 3 to 4 at another; and secondly, that it is generally accompanied by vomiting at the commencement of its operation. Though the latter is not severe, yet it has a very unpleasant effect in a purgative medicine. Hypercartharsis from the use of this oils is not generally attended with great debility and other dangerous symptoms, frequently observed under similar

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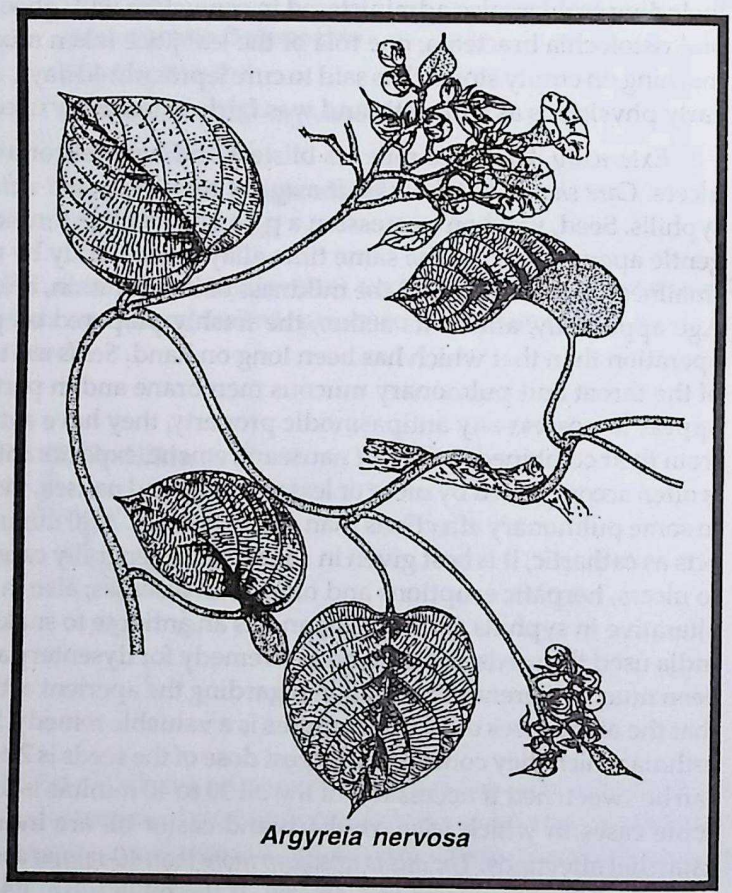
conditions from croton oil and some other purgatives. Smoke of the seeds relieves toothache; useful also in caries of the teeth. *Fresh root* bruised and applied to the part stung by scorpions gives relief. *Powdered root* in drachm doses is found useful in tape-worm, and in chronic cases of skin diseases.

N.B.: Oil seems to be a better preparation than the juice, which is an unstable compound.

Argyreia nervosa
(Family: Convolvulaceae)

Botanical Description

Very large, extensively spreading, silky pubescent climber; leaves 22 × 23 cm, simple, alternate, long-petioled, broadly ovate-cordate, apiculate at tip, glabrous green above, densely white silky velvety beneath; flowers rose-purple in axillary, many-flowered, bracteate cymes borne on stout peduncles, bracts ovate-lanceolate, acuminate, 3-4 cm long; sepals persistent, densely white tomentose outside; corolla woolly outside; stamens 5, included, filaments enlarged and villous at base, ovary globose, 4-ovuled, style filiform, stigma biglobose; fruit globose, indehiscent berry.



Argyreia nervosa

Habitat

The plant grows on river banks, edges of lakes and as an under-growth in semideciduous forests climbing over bushes, throughout most parts of India.

Aristolochia bracteata, Retz.

Vernacular Names

Eng.–Bracteated birthwort; *Mar.*–Kidamari; *Hind.*–Karimari.

Illness : **Snake bite**

Part used : Roots

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Preparation : A pinch of roots is washed and kept in a cup of water for 15 minutes.

Dosage : Half cup is taken twice with a gap of 15 minutes.

Illness : **Pus in Ears**

Part used : Leaves.

Preparation : A few leaves are washed, crushed and a juice prepared.

Dosage : 3 drops are put into each ear morning and evening for 5 days.

Illness : **Eczema**

Part used : Leaves.

Preparation : 2 handful of leaves are washed and juice prepared. A peacock's feather is burnt and the ashes mixed with the juice together with 1 teaspoon of coconut oil.

Dosage : The above mixture is applied to the eczema daily.

Aristolochia bracteata

Aristolochia clematitis

(Family: Aristolochiaceae)

Vernacular Name

Eng.–Birthwort.

Botanical Description

A perennial herb with a long, creeping rhizome and tall, erect, leafy, unbranched stem with alternate, pale-green, ovate to cordate, entire leaves. The dull-yellow trumpet-shaped flowers have swollen bases and grow from the axils of the upper leaves. The fruit is a pear-shaped capsule. All parts of the plant have a disagreeable smell and are *poisonous*.

Habitat

Birthwort is found in the warmer parts of Europe and Asia in thin woods and at the edges of fields and old vineyards and near houses. It was long ago introduced into Britain as a medicinal plant and subsequently became naturalized. It is now extremely rare in the wild, but it survives in a few

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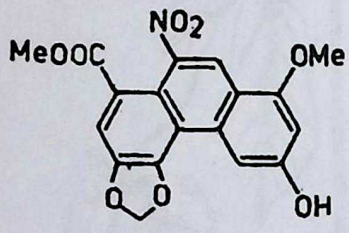
places near buildings in England and Wales. The generic name, *Aristolochia*, is derived from the Greek words *aristos* (= best) and *locheia* (= parturition or childbirth) and refers to the traditional use of the plant by mid-wives to ease labour, hence also the common name. Birthwort was also once used as a cure for snake-bite. The constituents are contained in some proprietary medicines, but the plant is nowadays rarely used by herbalists.

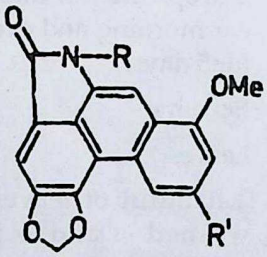
Constituents

Ceryl alcohol, β-sitosterol, aristolochic acid and KCl from leaves; aristolochic acid, KCl and KNO_3 from roots. Alcoholic extract of root active against adenocarcinoma 755 in mice. Aristolochic acid, mp. 283° isolated; aristolochic acid D, its Me ether lactam and aristololactam-β-D-glucoside; a tetracyclic sesquiterpene–ishwarone–isolated.

New Compounds



Aristolochic acid

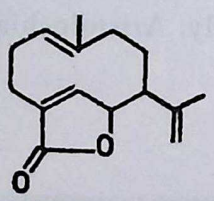


Aristolochic acid D Me ether lactam
R = H, R' = OMe
Aristololactam-β-D-glucoside
R = Glu,R' = H

Aristolochic acid, mp. 283°, isolated.

Aristolochic acid, mp. 283°, aristo red, mp. 286° and isorhamnetin obtained; a germacranolide–aristolactone–isolated.

New Compounds



Aristolactone

Aristolochic acid and aristo red isolated; aristolactone isolated.

Synthesis of ishwarone; two sesquiterpene alcohols–(12S)-7,12-secoishwaran-12-ol and (+)ledol–isolated from roots and characterised; aristolactam N-β-D-glucoside along with 3β-hydroxystigmast-5-en-7-one and 6β-hydroxy-stigmast-4-en-3-one isolated and its structure elucidated; isolation and characterisation of 2-hydroxy-1-methoxy-4H-dibenzo[de,g]quinoline-4,5-(6H)-dione (I) from roots; cephaeradione A, aristolactam A and β-sitosterol-β-D-glucoside also isolated; aristololide, along with 5α-stigmastan-3,6-dione, (-)cubebin and (-)hinokinin isolated from roots and its structure determined; new naphthoquinone–aristolindiquinone–isolated from roots.

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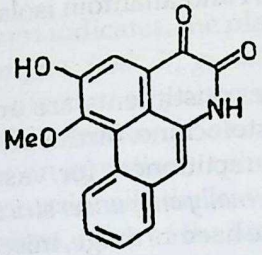
New Compounds



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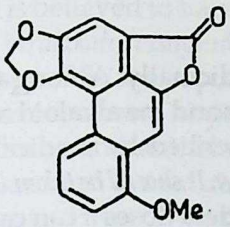
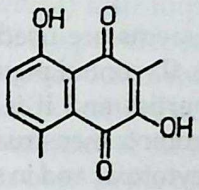
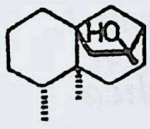


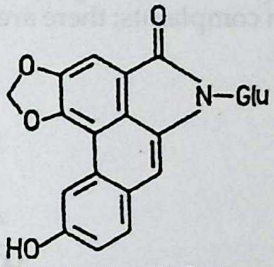
Aristololide



Aristolindiquinone



(12S)-7,12-Secoishwaran-12-ol



Aristolactam N-β-glucoside

Biological Activity

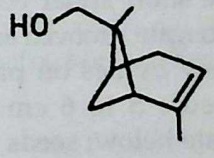
LD50, i.p., value of aristolochic acid in mice was 14.32 mg/kg. It neither prolonged survival time of tumor-bearing mice nor enhanced immune function of the mouse reticuloendothelial system and did not prevent the radiation and 2-dehydrodulcitol-induced damage to erythropoietic stem cells.

Pin-2-en-8-ol and its acetyl derivative isolated from essential oil of aerial parts along with β-caryophyllene, caryophyllene oxide, linalool and bornyl acetate. Volatile fraction from underground parts contained calarene, maaliol and 1(10)-aristolen-2-one; a new aristolochic acid derivative (I) and aristolochic acids I, II, III and IV isolated from roots; fatty acids, polypremols and methyl, ethyl, isobutyl and phytyl esters of fatty acids obtained from nonvolatile fraction of root extract and aerial parts.

New Compounds

I

R,R' = H,R" = NHCH(Me)COOH
Aristolochic acid I
R = H,R' = OMe, R" = OH
Aristolochic acid II
R,R' = H,R" = OH
Aristolochic acid III
R = OMe, R' = H,R" = OH
Aristolochic acid IV
R,R' = OMe, R" = OH



Pin-2-en-8-ol

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Aristolochic acids A and C, 7-hydroxyaristolochic acid A and allantoin isolated.

Uses

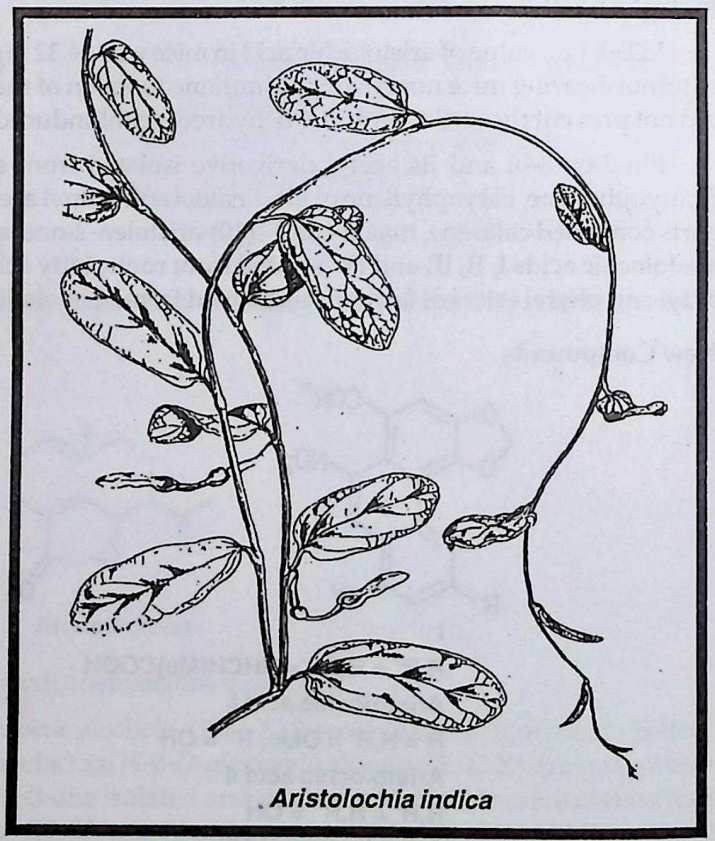
The flowering stems are used medicinally. Among the constituents are aristolochic acid, an essential oil, tannins, flavonoid pigments and the alkaloid aristolochine. Birthwort has antispasmodic and analgesic properties and it is prescribed by medical practitioners for vascular diseases and thrombosis and to promote menstrual flow. *It should be taken internally only under strict medical supervision.* Aristolochic acid is cytotoxic and in sufficient doses it can cause haemorrhage, miscarriage in pregnant women, permanent damage to the liver and kidneys, and even cardiac and respiratory failure. Birthwort is also anti-inflammatory and a decoction has been used externally to treat wounds, ulcers, eczema and other skin complaints; there are, however, many safer remedies and its use in these ways is not recommended.

Aristolochia indica

(Family: Aristolochiaceae)

Botanical Description

Perennial twiner with long, slightly tuberous roots; leaves simple, alternate, short-petioled, ovate-lanceolate, acute, entire, 10 × 4 cm; flowers greenish purple in axillary cymes; perianth monochlamydous and gamophyllous, pitcher-shaped, upto 3.8 cms long, basal part swoollen or inflated, the middle part contracted to form a narrowly funnel-shaped tube and the distal part expanded into an obliquely two-lipped limb; stamens 6, adnate to the short stylar column; ovary inferior, elongate, grooved and six-celled with many ovules on parietal placentae; capsule 5 to 6 cm long, 6-valved, truncate below; seeds many with papery wings.



Aristolochia indica

Habitat

The plant is distributed in all the provinces of India and in Sri Lanka, Nepal and Bangladesh. It is usually found scrambling over hedges and bushes.

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Uses

As the name *iswari* indicates, the plant is believed to have the power to neutralise or resist snake poison. Other synonyms (*nakuli, garudi, karalakah, visaghni, visavega*) also imply its property of destroying the toxic effects of all poisons, especially snake poison. It is a purifier of blood (*asradosajit*) and hence useful in skin diseases. It is heals wounds and dispels diseases due to the morbidity of *vata, pitta* and *kapha*. It is an appetiser, aphrodisiac and anthelmintic and relieves burning sensation. Chiefly the root and occasionally the leaves are used in medicine. Fresh juice of the leaves is a favourite antidote to snake poison. Juice of the leaves and also of the bark is used in the bowel complaints of children, diarrhoea and in intermittent fevers. Roots are sometimes used for abortion by quacks. *Niladaladitailam, Parantyaditailam, Pathadi gulika* etc. are some of the preparations using the drug.

Armoracia rusticana
(Family: Cruciferae)

Vernacular Name

Eng.–Horseradish.

Botanical Description

A perennial herb with a thick rootstock and long, cylindrical fleshy roots and an erect, branched stem. The large basal leaves are oblong and long-stalked, with undulate and serrate margins; the stem leaves are smaller and narrower, short- stalked or sessile, and toothed or entire. The numerous white flowers are arranged in a compound terminal panicle. The fruit is an oval silicula, which rarely ripens in Britain.

Habitat

Horseradish is native to southeastern Europe but it was introduced to other European countries in medieval times. In Britain it is often naturalized on waste ground and by streams, it is much rarer in Ireland. It is widely cultivated for the condiment prepared from the roots; cuttings are planted in light, well-drained soil where they grow to full size during summer and are then lifted either in the autumn or the following spring. The roots can be preserved during winter by storing them in sand. The generic name, *Armoracia*, was used by Pliny who recommended the plant for its medicinal properties. The common name, Horseradish, means a coarse or strong radish, the prefix 'horse' often being used in plant names to denote a large, strong or coarse kind.

Uses

The fresh root is usually used for medicinal and culinary purposes, but dried or bottled root is also effective. Among the constituents are an essential oil with mustard glycosides, enzymes and vitamin C. Served as a condiment with cooked meat Horseradish stimulates digestion. It also has diuretic, antiseptic, rubefacient, mild laxative and expectorant actions. It is contained in a few proprietary medicines for influenza and infections of the urinary tract. Rheumatic pain can be relieved by Horseradish poultices. *Frequent application to the same spot, however, may irritate the skin* and cause a rash. Large internal doses may also irritate the digestive tract.

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Arnica montana

(Family: Compositae/Asteraceae)

Vernacular Names

Eng.–Arnica, Mountain Tobacoo.

Botanical Description

A perennial herb with a creeping rhizome bearing an erect, branched, slightly hairy, glandular stem. The basal leaves, which are arranged in a rosette, are ovate, downy and crowded near the stem base; the smaller and fewer stem leaves are ovate to lanceolate, opposite and sessile. There are one to three terminal, bright-yellow, daisy-like flowerheads. The ligulate ray-florets are female and irregularly turned back. The fruit–a black, downy, cylindrical achene–has a pappus with one row of rough hairs. All parts of the plant are aromatic.

Habitat

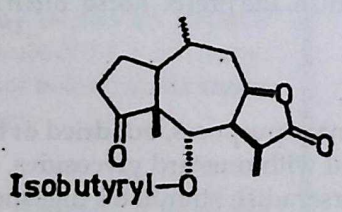
Arnica is found in grassy places in hills and mountains in Europe and North America but it is becoming rare in the wild and in many countries it is now protected. It is not native to the British Isles but is often grown in gardens. The generic name *Arnica* is thought to be derived from the Greek word *arnikos* (= lamb's skin), an allusion to the texture of the leaves. In countries where Arnica is indigenous it has long been a popular herbal remedy.

Constituents

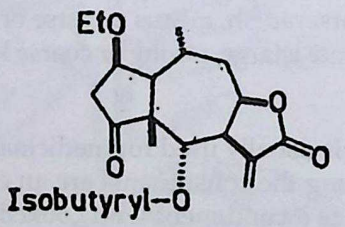
Isopropyl myristate and propylene glycol extracts of inflorescence showed antimicrobial activity and were suitable for use in cosmetic preparations.

Isopropyl myristate extract contained phenolic acids, sterols and carotenoids whereas propylene glycol extract contained sugars, carotenoids and flavonoids; homologous series of oligofructosides isolated in which fructofuranosyl residues attached by (2→1′) β-linkages to fructosyl unit of sucrose, scolymoside, cinaroside, apigenin-3-O-β-D-glucopyranoside, isoquercitrin, astragalin, caffeic, ohlorogenic and ferulic acids, scopoletin, umbelliferone, histidine and aspartic acid isolated; 11,13-dihydrohelenalin and helenalin isolated from flowers in addition to 6-O-isobutyryl-, 6-O-tigloyl-, 6-O-isovaleryl- and 6-O-(2-methylbutyryl)-helenalin; 6-O-isobutyryltetrahydrohelenalin (I) and 2β-ethoxy-6-O-isobutyryl-2,3-dihydrohelenalin (II) also isolated from flowers.

New Compounds



I



II

Uses

All parts of the plant are of medicinal value, but the flowerheads, and sometimes the rhizomes, are mostly used. Only the ray- and disc-florets–without the involucre and receptacle–are processed.

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Among the constituents of the florets are traces of an essential oil, organic pigments (carotenoids), the bitter compound arnicin, the saponin arnidendiol, arnisterol and the flavonoid glyosides isoquercetin and astragalol. The rhizomes contain tannins, up to 6.3 per cent of an essential oil and resin. Arnica has tonic, anti-inflammatory and vasodilating properties but it is also a severe irritant of the internal organs and is now rarely prescribed for internal use. *It should be taken internally only under strict medical supervision.* Externally a diluted infusion or decoction is used for bathing superficial wounds, bruises and sprains and as a component of mouthwashes and gargles. In homeopathy a tincture is used for trauma.

Artanema longifolium
(Family: Scrophulariaceae)

Botanical Description

Glabrous herbs to 1.5 m tall; stem 4-angled; leaves opposite; short-petioled, lanceolate or ovate-lanceolate, to 26 × 7.5 cm, green above, pale below; flowers lilac in terminal bracteate racemes; calyx accrescent, 5-lobed; corolla blue or purple, gamopetalous, 2-lipped; stamens 4, didynamous, the posterior pair shorter with a small scale at the base of the filaments; ovary superior, 2-celled with many ovules on axile placenta, style slender ending in a bilamellate stigma; capsule globose; seeds many small.

Habitat

The plant is found in W. Coast, in Malabar and Travancore, up to 3,000 ft. in semi-evergreen forests, especially near streams or other water sources.

Artanema longifolium

Artemisia abrotanun
(Family: Compositae)

Vernacular Name

Eng.–Southern Wood.

Botanical Description

A perennial, compact, woody subshrub thickly covered with finely divided (upto three times pinnate) greyish-green leaves. The tiny yellow flowerheads grow in slender racemes in the axils of the upper leaves. Ray-florets are absent. The fruit is a cylindrical and slightly flattened achene, without a pappus.

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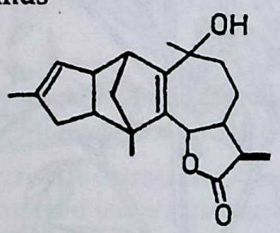
Habitat

Native to Asia, Southernwood has spread through cultivation to Europe and the Americas. It is a popular and easily grown garden plant but it rarely flowers and sets seed in the British Isles and other northern parts of Europe. In the Mediterranean countries it is grown as a field crop for its bitter ingredients. All parts of the plant have a pleasant lemony fragrance and in the old days this was put to good use in the home to freshen the air. The scent repels bees and other insects and dried leaves in muslin bags will keep away clothes moths. The plant can also be used in flower decorations. This species, and others in the *Artemisia* group, are named after Artemis or Diana, the goddess of the hunt and the moon, who watched over women and children. The herb used to be taken to encourage menstruation and it also had a reputation as an aphrodisiac. One of the alternative common names of *A. abrotanum*, Lad's Love, is said to refer to the old habit of including a spray of the plant in bouquets given by country lads to their sweethearts.

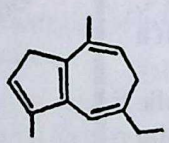
Constituents

Myrcene, α-pinene, thujyl alcohol, nerol and thujyl acetate isolated from volatile oil; chemical studies on artabsin, mp. 131°; two fulvene hydrocarbons isolated and identified as 3,6-dihydrochamazulene and 5,6-dihydrochamazulene; structures for artabsin and absinthin proposed; a carbohydrate and 3,4,5-trimethoxybenzoic acid.

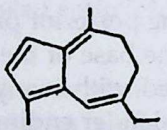
New Compounds



Absinthin



3,6-Dihydrochamazulene



5,6-Dihydrochamazulene

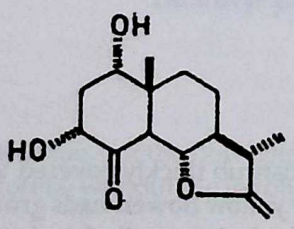
Camphene, α- and β-pinene, sabinene, α-terpinenc, cineole, p-cymole, artemisia ketone camphor and four unidentified compounds separated from essential oil by GLC.

7-Methoxycoumarin, mp. 117°, and 6,7-dimethoxycoumarin, mp. 144°–isolated; capillene and 3-(2-butynyl) isocoumari from roots.

Umbelliferone and genkwanin isolated.

Bitter principles are appetite-stimulating; an isomer of santonin, mp. 133°, 1,8-cineole and 1-camphor; a new sesquiterpene lactone–erivanine, mp. 203°–from flower sheaths and leaves; lumisantonin, mp. 153°; (-)santonin and (-)β-santonin.

New Compounds



Erivanine

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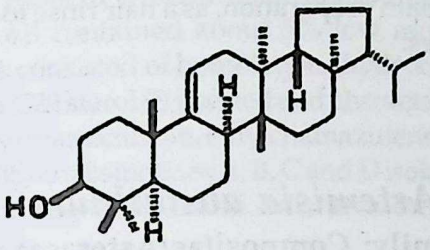
Trideca-1,3 5-trien-7,9,11-triyne, artemisia ketone and 1-acetoxytetradeca-4,6-dien- 8,10,12-triyne isolated from roots; a pentacyclic triterpene –fernenol, mp. 194°– from rhizomes; (-)thujone,α-amyrin and its acetate, fernenol, stigmasterol and β-sitosterol isolated.

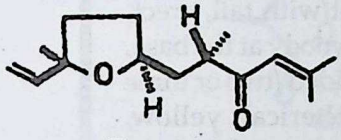
New Compounds



Fernenol

A new sesquiterpenoid ketone–davanone–isolated from oil and identified as 2-methyl-2-vinyl-5-(3-oxo-5-isopropylidene-2-pentyl)-tetrahydrofuran.

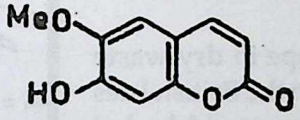
New Compounds



Davanone

Scopoletin characterised as 6-methoxy-7-hydroxycoumarin.

New Compounds

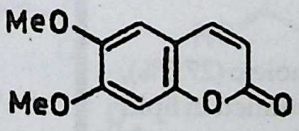


Scopoletin

Essential oil used in therapy of urolithiasis.

Scoparone characterised as 6,7-dimethoxycoumarin, mp. 142°; scoparone from flowers.

New Compounds



Scoparone

Presence of artabsin, mp. 135°, absinthin, mp. 179° and another compound, mp. 156°.

Habitat

Karnataka, cultivated elsewhere.

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Uses

The flowering stems are used medicinally. The constituents include a large amount of an essential oil (absinthol), also bitter compounds, tannins and alkaloids. Southernwood has tonic, stomachic, diuretic, anthelmintic and diaphoretic properties. Internally it is used in herbal medicine as an infusion; externally a decoction is used as a bath preparation, as a hair rinse to rinse the scalp or as a compress to treat frostbite and cuts and grazes.

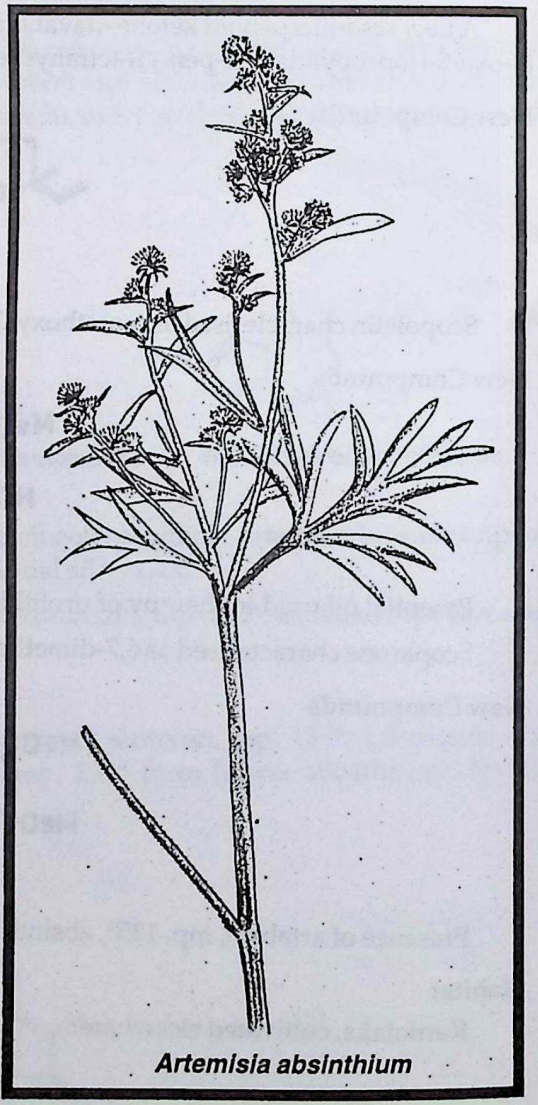
Artemisia absinthium
(Family: Compositae/Asteraceae)

Vernacular Name

Eng.–Wormwood.

Botanical Description

A perennial herb of tufted habit with tall, erect, furrowed and angled stems, usually woody at the base, and alternate, silvery-green, finely divided (two or three times pinnate) leaves. The hemispherical, yellow, rayless, drooping flowerheads are arranged in long racemose panicles. The fruit is a cylindrical, slightly flattened achene, with no pappus. All parts of the plant are covered with a silvery-white down.


Artemisia absinthium

Habitat

Wormwood grows all over Europe in dry waste places, such as roadsides. It is native to the British Isles but is generally uncommon. It is a very old herbal remedy and is frequently grown in herb gardens. The common name, Wormwood (from the Anglo-Saxon word *wermod*), and the word for the aperitif Vermouth, which used to be flavoured with the herb, have the same linguistic origin.

Constituents

Palmitic (33.99), arachidic (26.2), linoleic (27.5%), lauric, myristic, stearic and oleic acids identified in lipid fraction; detection of α- and β-pinenes, p-cymene, β-phellandrene, azulene, cineole, thujone, nerol, neryl acetate and cadinene in volatile oils of leaf (0.22%), flower (0.35%), stem (tr) and herb (0.3%) by TLC; anabsin isolated and structure determined; detection of α-thujene, α-pinene, camphene, p-cymene, 1,8-cineole, methylheptenone, β-phellandrene, caryophyllene oxide, α-terpineol, thujyl alcohol, thujyl acetate,

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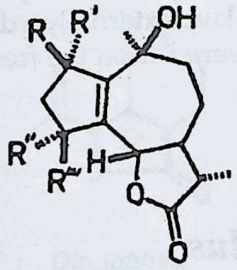
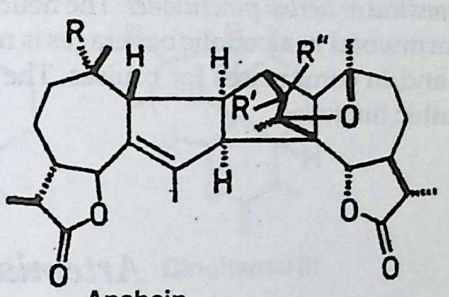
geraniol, caryophyllene, α-himachalene, α-cadinene and elemol in essential oil by GLC; artemoline isolated from leaves and flowers and structure elucidated; crystal structure of anabsin; structures of anabsinthin and absinthin revised; crystal structure of absinthin; a homologous series of oligosaccharides isolated from roots in which fructofuranose units joined by β(2→1′) linkages to fructose unit of sucrose; seed oil contained about 5% low molecular weight triacylglycerides; nonglyceride lipids of seed hulls consisted of homologous hydrocarbons C25-31, wax esters C23-32, fatty acid esters and terpenoids; a C29 sterol (I) isolated and characterised; (-)methyl jasmonate isolated; detection of chamazulene, methylchamazulene, ethylchamazulene, β-caryophyllene, α-bisabolol and β-thujone in essential oil by GC-MS; artabsinolides A, B, C and D isolated, characterised and synthesised; a new guainolide dimer–absintholide–isolated and structure determined.

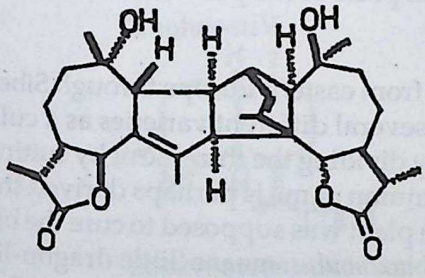
New Compounds



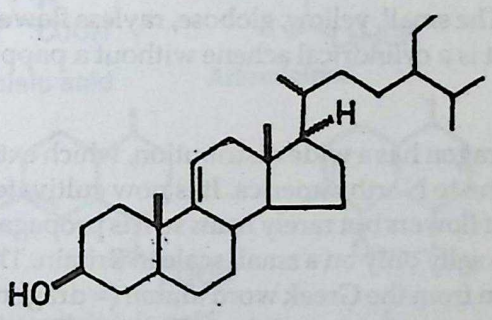
Artabsinolide A
RR' = O, R" = OH, R"' = Me
Artabsinolide B
RR' = O, R" = Me, R"' = OH
Artabsinolide C
R = H, R' , R" = OH, R"' = Me
Artabsinolide D
R, R"' = OH, R' = H, R" = Me



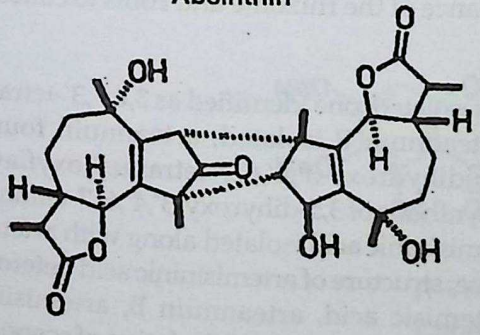
Anabsin
R, R' = OH, R" = H
Anabsinthin
R = OH, R', R" = H



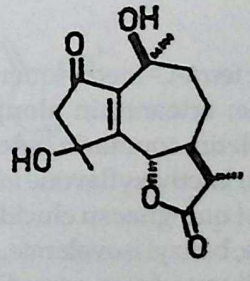
Absinthin



I



Absintholide



Artemoline

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Biological Activity

Senescence-promoting effect of methyl jasmonate was much stronger than that of ABA; even at 1.0-2.5 µg/ml, it completely eliminated antisenescence action of 2.0 µg/ml kinetin.

Uses

The flowering stems are used medicinally. The constituents include an essential oil with thujone and thujole, a bitter compound (absinthin), organic acids and tannins. The herb has a very bitter taste. It has tonic, stomachic, choleretic, carminative, antiseptic and anthelmintic properties. It was once used for many disorders but nowadays it is mostly used, on its own or in tea mixtures, for various digestive upsets. *Taken over a long period, however, Wormwood becomes habit-forming and will eventually cause serious brain damage. It is thus advisable to take Wormwood internally only under the supervision f a qualified medical or herbal practitioner.* The neurotoxic agents are thought to be thujone and thujole. The use of Wormwood in alcoholic beverages is now prohibited by law. Externally a decoction is used as a gargle and in compresses for bruises. The essential oil recovered from the fresh plant is used in homeopathic tinctures.

Artemisia dracunculus

(Family: Compositae)

Vernacular Name

Eng.–Tarragon.

Botanical Description

A perennial herb with a rhizome, erect leafy stems and alternate, green, entire, linear to lanceolate leaves. The small, yellow, globose, rayless flowerheads are arranged in long, loose terminal panicles. The fruit is a cylindrical achene without a pappus. All parts of the plant are aromatic.

Habitat

Tarragon has a wide distribution, which extends from eastern Europe through Siberia, Mongolia and China to North America. It is now cultivated in several different varieties as a culinary herb. In Europe it flowers but rarely fruits so it is propagated by dividing the rhizome or by cuttings. It is grown commercially only on a small scale in Britain. The common name is perhaps derived through Arabic and Latin from the Greek word *drakon* (= dragon)–the plant was supposed to cure the bites and stings of venomous animals and dogs. The specific name, *dracunculus*, means 'little dragon-like'. This may refer to the healing properties or to the resemblance of the rhizome and roots to coiled snakes.

Constituents

Two isomeric tetra-O-methylquercetagetins isolated; one identified as 3,6,7,3′-tetra-O-methyl-5,3′-dihydroxyflavone; arteannuin along with arteannuin B isolated; arteannuin found identical to qinghaosu; scopoletin, coumarin, artemetin, 3,5-dihydroxy-3′,4′,6, 7-tetramethoxyflavone and 3,3′,5-trihydroxy-4′,6,7-trimethoxyflavone identified; synthesis of 3,5-dihyroxy-3′,4′,6, 7-tetramethoxyflavone; crystal structure of quinghaosu elucidated; artemisininic acid isolated along with artemisinin, borneol acetate, 1,8-cineole, benzyl isovalerate, β-farnesene; structure of artemisininic acid determined; artemisia ketone and β-selinene from essential oil; artemisic acid, arteannuin B, artemisinin and a new naphthofuranone derivative (I) isolated and its structure determined; isolation of scopoletin, coumarin,

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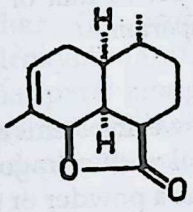
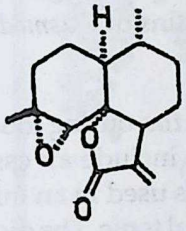
quercetagetin- 6,7,3′,4′-tetramethyl ether, quercetagetin-6,7,4′-trimethyl ether and artemetin; qinghaosu I and III along with camphene, isoartemisia ketone, (-)camphor, β-caryophyllene and β-pinene isolated from volatile oil; artemisic acid, its methyl ester and artemisinol isolated; arteannuin, artemisic acid, arteannuin A, arteannuin B, hydroarteannuin and stigmasterol identified qinghaosu I,II (arteannuin B) and III, a flavonol (II) and scopoletin isolated from essential oil; qinghaosu IV, qinghaosu V and qinghao acid (artemisic acid) isolated together with chrysosplenol; artennuin B synthesised; qinghaosu synthesised; α-pinene, 1,8-cineole, ylangene, β-caryophyllene, β-selinene, camphene, β-pinene, α-terpinene, γ-terpinene, p-cymene, β-elemene, trans-pinocarveol (2.5%), artemisia ketone, 2,5,5-trimethyl-2,6- heptadien-4-one detected in essential oil; camphene, β-pinene, isoartemisia ketone, (-)camphor and β-caryophyllene identified in volatile oil; artemisinin isolated from aerial parts; epoxyarteannuinic acid isolated, characterised and synthesised.

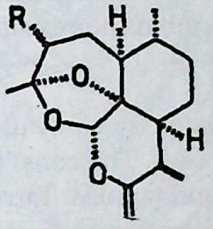
New Compounds



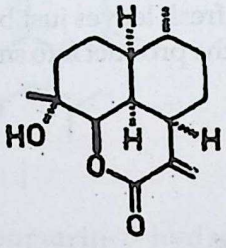
Qinghaosu I



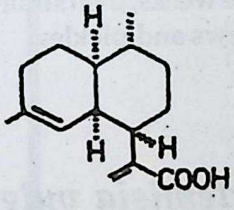
Qinghaosu II



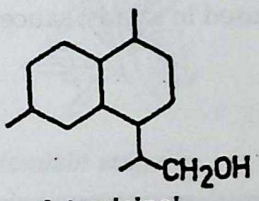
Qinghaosu III
R = H
Qinghaosu IV
R = H



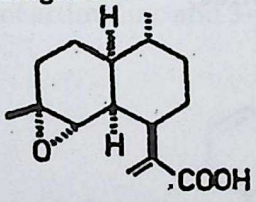
Qinghaosu V



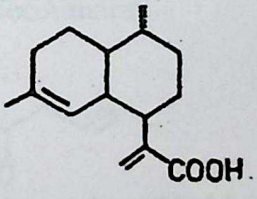
Artemisic acid



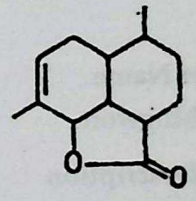
Artemicinol



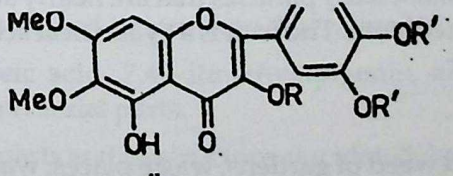
Epoxyasteannuinic acid



Artemisininic acid



I



II
R = H, R' = Me
Chrysoplenol
R = Me, R' = H

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Biological Activity

Qinghaosu exerted direct parasiticidal action *in vivo* and *in vitro* on *Plasmodium* in erythrocyte stage. It showed good therapeutic results in almost all cases and did not cause adverse reactions in clinical studies; artemisinine showed antimalarial activity; artemisic acid (0.125–0.5 mg/ml) showed effective antibacterial activity against *Staphylococcus aureus, Escherichia coli, Bacillus dysenteriae* and typhoid bacillus; arteannuin (0.1 µm) suppressed growth of *Plasmodium falciparum* in *in vitro* culture; its antimalarial action was different from that of chloroquine; phagocytic activity of macrophages from *Plasmodium* in *in vitro* culture system was increased in presence of arteannuin. Acid phosphatase activity was also increased in abdominal macrophages from arteannuin-treated mice as compared with those from control mice. Antimalarial activity of arteannuin may be associated with its macrophage phagocytic enhancing effect; ED50 of artemisinin for inhibiting *Plasmodium falciparum* strain FCC-l/HN *in vitro* was 1.99 ng/ml as compared to ED50 of 1.24 mg/ml for chloroquine; artemisinin showed potent inhibitory activity *in vitro* comparable to that of mefloquine, against chloroquine- susceptible and resistant strains of *Plasmodium falciparum*.

Uses

Although Tarragon is mainly used for flavouring food, the flowering stems are occasionally used for medicinal purposes. The constituents include an essential oil with estragole and phelandrine, bitter compounds and tannins. Tarragon is used in an infusion, as a powder or tincture to stimulate the appetite, to aid digestion and as a general tonic. The distilled essential oil is used in the manufacture of some toilet preparations.

Tarragon is widely used in the food and canning industries. For home cooking no garden should be without it. Tarragon vinegar is easily prepared by steeping fresh leaves just before flowering in a good, white wine vinegar for two or three weeks, then straining the product into small bottles. Separate leaves can be used in salads, sauces, stews and pickles.

Artemisia vulgaris
(Family: Compositae)

Vernacular Name

Eng.–Mugwort.

Botanical Description

A perennial herb of tufted habit with a reddish, furrowed, angled, sparsely hairy stem. The alternate, pinnately lobed leaves are dark green, usually hairless above and white-woolly beneath. The stem leaves are pinnate or bipinnate, nearly sessile and clasp the stem. The small, oval, yellowish flowerheads are arranged in dense leafy panicles that are nearly straight and grow from the leaf axils in the upper part of the branched stem. The fruit is a cylindrical achene without a pappus. All parts of the plant are slightly aromatic.

Habitat

Mugwort is a widespread weed of gardens, waste places, waysides and hedgerows throughout the British Isles. It is one of the oldest known medicinal plants and it was also believed to have magical

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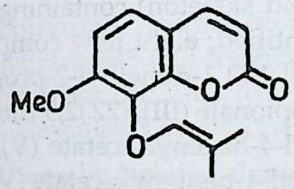
powers. The origin of the common name is confused. It may be derived from the Anglo-Saxon words *mycg* (= a midge) and *wyrt* (= a herb) and perhaps refers to the plant's small flowers or to the traditional use of bunches of the plant for catching insects. Or the plant may be named 'mugwort' because it was once used for flavouring beer before the introduction of hops.

Artemisia vulgaris

Constituents

Daphnetin-7-methyl-8(3,3-dimethylallyl)ether (I) and 3,4-dimethoxy-2-hydroxycinnamic acid isolated from aerial parts along with daphnetin-7-methyl ether, daphnetin dimethyl ether and daphnetin methylene ether.

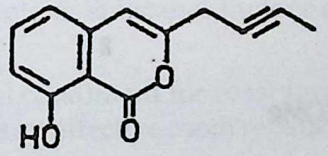
New Compounds



I

A new isocoumarin–8-hydroxy-capillarine–isolated and structure determine; synthesis of artimidine and 3-propylisocoumarin.

New Compounds



8-hydroxycapillarine

6,7-dimethoxycoumarin isolated and its structure determined.

Isolation of scopoletin, caffeic acid, 7,4'-dimethylapigenin, acacetin, 5,7,4'-trihydroxy-6,3'-dimethoxyflavone and velutin from aerial parts.

Alhanol isolated from aerial parts and its structure elucidated; hydroxy davanone isolated from essential oil; conformation of gallicin determined; synthesis of lavandulol; maritimin along with a selineolide and vulgarin isolated and characterised; crystal structure of erivanin; new sesquiterpene lactone–artapshin–isolated from aerial parts and its structure established.

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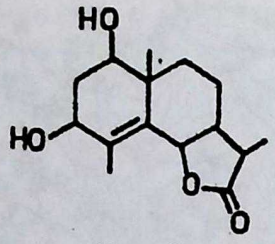
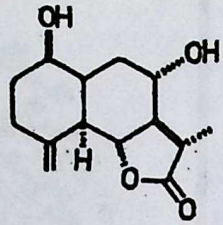
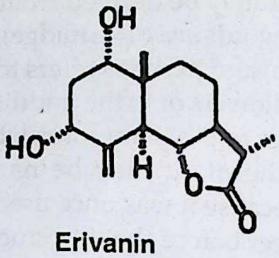
New Compounds



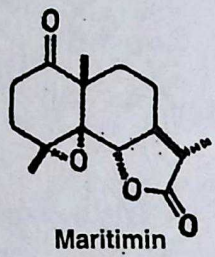
Alhanol



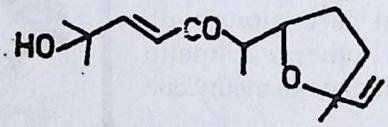
Artapshin



Erivanin



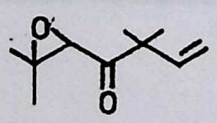
Maritimin



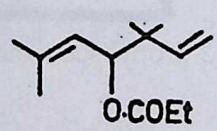
Hydroxydavanone

Twenty one irregular monoterpenes (non head-to-tail isoprenoid skeleton) containing either artemisyl or santolinyl skeleton isolated from essential oil and identified; eight new compounds characterised as 5,6-epoxy-3,3,6-trimethyl-1-hepten-4-one (I), 3-methyl-1-(1,1-dimethyl-2-propenyl)-2-butenyl propionate (II), (2E)2,5-dimethyl-4-vinyl-2,5-hexadienyl propionate (III), (2Z)2,5-dimethyl-4-vinyl-2,5-hexadienyl acetate (IV), 5-methyl-2-methylidene-3-vinyl-4-hexenyl acetate (V), 1,1,4-trimethyl-2-vinyl-3-pentenyl acetate (VI), 1,1,4-trimethyl-3-oxo-2-vinyl-4-pentenyl acetate (VII) and two diastereoisomers of 3-hydoxy-1,1,4-trimethyl-2-vinyl-4-pentenyl acetate (VIII).

New Compounds



I



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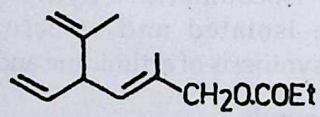
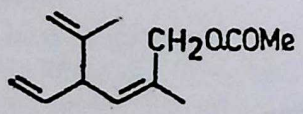


III



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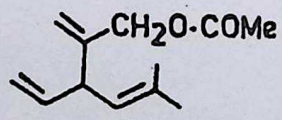

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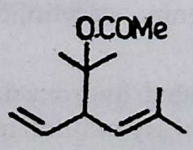

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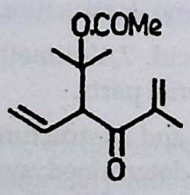
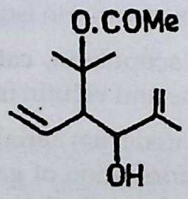


VII



VIII

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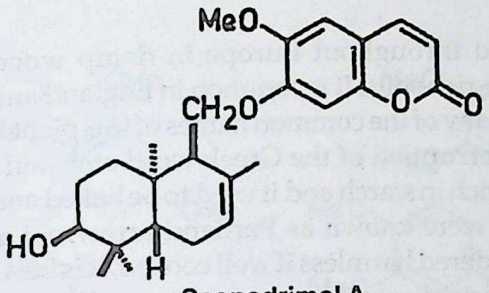
Detection of camphene, p-cymene, sabinene, γ-terpinene, 1,8-cineole, linalool, isoborneol, geraniol, borneol, eugenol, methyleugenol, methylisoeugenol, acetoeugenol, γ-cadinene and farnesol in essential oil by GLC; stereoselective synthesis of davanone.

Scopodrimol A isolated along with scopofarnol and isofraxidin-derived sesquiterpene ethers from roots; structure of scopodrimol A determined.

New Compounds



Scopodrimol A

Detection of α-pinene, limonene, α-terpinene, 1,8-cineole, linalool, α-terpineol, β- caryophyllene, β-elemene and β-caryophyllene oxide in oil by GLC; 8- hydroxydotriacontan-27-one together with friedelan-3-one, multiflorenone, stigmastanone, C14-cis-spiroketalenol ether, sesamin and β-sitosterol isolated from aerial parts.

Scoparone, thymol, eugenol, 2-acetoxy-4,5-dimethoxycinnamic acid, β-pinene (10.2%), α-phellandrene (5.6%), longicyclene, δ-cadinene, 1-phenyl-2-hexen-4-yne and 1-phenyl-2,5- hexadiyne isolated from oil; 7-methyl-aromadendrin, rhamnocitrin, eupalitin, cirsimaritin, eupatoletin, 7-methylesculetin, scoparone and scopoletin isolated from inflorescence.

Artemolin isolated along with absinthin from aerial parts.

Uses

The flowering stems are used medicinally. The main constituents are an essential oil, with cineole and thujone, tannins and bitter compounds. Like other species of *Artemisia* Mugwort is used as a general tonic, as an appetizer and stomachic and as a seasoning, but its action is not as strong. It is a traditional treatment for nervous disorders, insomnia and gynaecological complaints. The essential oil extracted from the fresh leaves is used in preparations as an expectorant, diuretic and anthelmintic. Because Mugwort contains the neurotoxic substance thujone *care should always be taken over the dosage and duration of treatment*.

In cooking Mugwort is a useful condiment for roast meat, especially pork and mutton and fat poultry such as goose and duck. It is an effective moth repellent.

Arum maculatum

(Family: Araceae)

Vernacular Name

Eng.–Lords-and-Ladies.

Botanical Description

A perennial herb with a tuberous rhizome and basal, long-stalked sagittate leaves, sometimes

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spotted brown or black. The flowering stem bears a pale yellow-green, trumpet-shaped spathe, edged and sometimes spotted with purple, which encloses the inflorescence–a purplish, cylindrical flowerhead called a spadix. The flowers are all unisexual; those in the lower part of the spadix are female, those in the middle are sterile, and those at the top are male. The spadix has a strong unpleasant smell which attracts insects to the plant. They crawl down inside the spathe and pollinate the flowers. *All parts of the plant are poisonous, especially the scarlet berries which can be fatal if eaten by children.*

Habitat

Lords-and-Ladies is found throughout Europe in damp woods and in shady copses and hedgerows, particularly on lime-rich soils. It is common in England and Wales but less so in Scotland and Ireland. Through the ages many of the common names of this plant have had a sexual connotation. The generic name, *Arum*, is a corruption of the Greek word *aron* and may originally have been an Egyptian name. The rhizome is rich in starch and it used to be baked and eaten. Preparations from the baked and powdered rhizome were known as Portland arrowroot and Portland sago. However, although the rhizome can be rendered harmless if well cooked, it is best not to eat it. In the past Lords-and-Ladies also had many medicinal uses–for example, in medieval times the rhizome was used in powder mixtures with other herbs to aid digestion–but it is now regarded as too toxic for use as an internal herbal medicine.

Uses

The rhizome contains the toxic glycoside aronin, also saponins, starch and calcium oxalate, which gives the plant its sharp burning taste. It is diuretic and strongly purgative. *Lords-and-Ladies should never be collected and used for self-medication.* Symptoms of poisoning are severe vomiting, abdominal cramps and diarrhoea.

Asarum europaeum
(Family: Aristolochiaceae)

Vernacular Name

Eng.–Asarabacca.

Botanical Description

An evergreen perennial herb of low, creeping habit with a branched rhizome and short hairy stems with whitish or brownish scale leaves at the base. The leaves are glossy, dark green, long-stalked and reniform. The solitary short-stalked, brownish-red flowers are borne terminally and are bell-shaped, three-lobed and downy. The fruit is a globose capsule with flat seeds inside. All parts of the plant have a camphor-like smell and are *poisonous*.

Habitat

Asarabacca has a scattered distribution in Europe in woods and thickets. In many countries it is now a protected species. In the British Isles it may be native in a few places, though not in Ireland, and is generally extremely rare. It is, however, grown in gardens. Asarabacca was used in ancient Greece to treat kidney complaints and in wine-making and in later times as a purgative and emetic. Because

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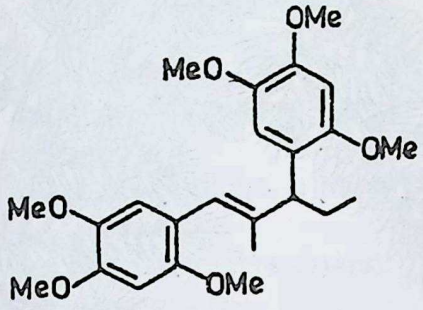
of its harmful effects, however, it is now rarely used in medicine. The common name Asarabacca is a combination of the Greek and Lydian names (*asaron* and *bakkar*) for the plant.

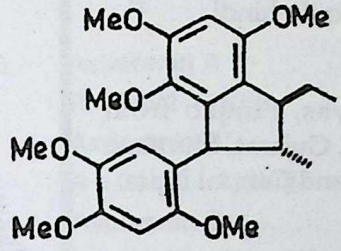
Constituents

α-Agarofuran (1.0%) isolated from essential oil; furopelargone A isolated from essential oil and its structure determined; trans- and cis-isoasarones synthesised; diasarone-1 and diasarone-2 isolated and their structures determined.

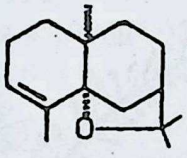
New Compounds



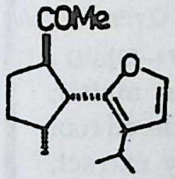
Diasarone-1



Diasarone-2



α-Agarofuran



Furopelargone A

Biological Activity

Trans-isoasarone and isomethyleugenol, active substances of the preparation 'Escarol', showed expectorant effect depending on concentration or doses. Their activity was significantly higher than that of standard expectorant preparations; local anaesthetic activity of trans-isoasarone, trans-isoeugenol methyl ether and trans-propenylbenzene in healthy volunteers was dependent on number of methoxy groups; thus, trans-isoasarone showed greatest and trans-propenylbenzene lowest activity.

Longifolene, α-phellandrene, β-pinene, limonene, bornyl acetate, α-himachalene, α-santalene, elemicin, alloaromadendrene, 3-isopropyl-5,5-dimethylcyclohexenone, o-cymene, and ethylmethyl terephthalate detected in essential oil by GC-MS.

The rhizome and the leaves have medicinal actions. The principal constituents are an essential oil from which asarone (known as Asarabacca camphor) is crystallized, also starch, resin and flavonoids. The dried herb has a bitter taste. It is a strong emetic, diuretic and purgative. A pinch of the powdered herb in snuff mixtures induces sneezing and a copious flow of mucus. *It is dangerous to use Asarabacca internally except under strict medical supervision:* strong doses can cause haemorrhaging and, in pregnant women, miscarriage.

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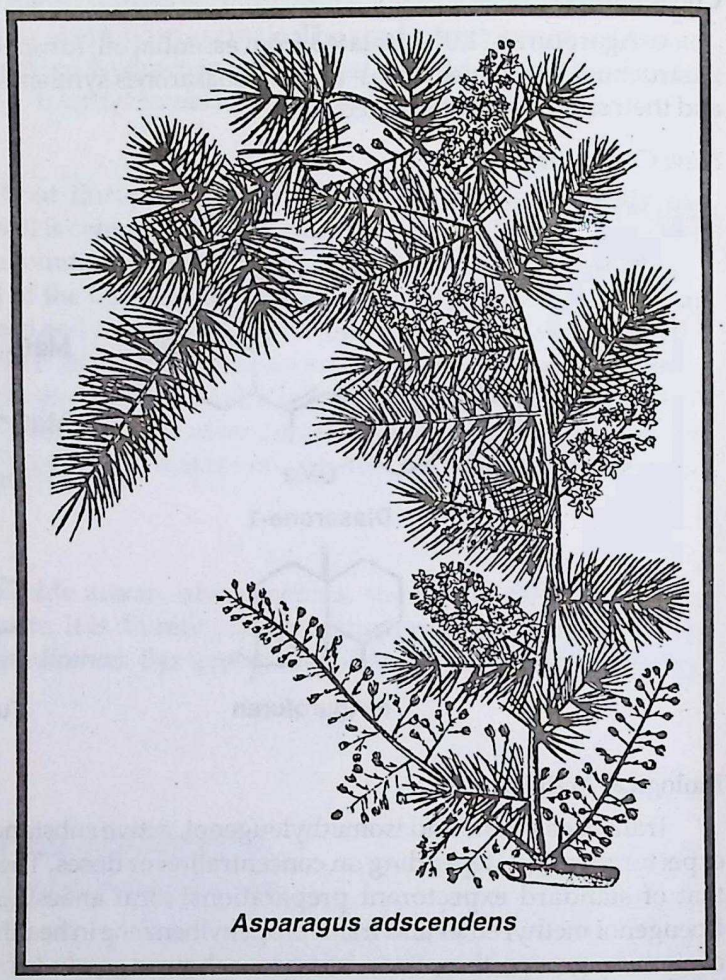
Asparagus adscendens, Roxb.

(Family: Liliaceae)



Asparagus adscendens

Vernacular Names

Bom., Hin., Mah. & Guj.–Sufed or Safeta Musli, Sataver; *U.P.*–Khairuwa; *Tam.*–Tannirvittang; *Tel.*–Tsallogadda; *Mal.*–Shedeveli; *Sinh.*–Hirtha-wariya; *Arab. & Pers.*–Shaqaqule-hindi.

Habitat

West Himalayas, Punjab from Murree to Kumaon, Gujarat, Mumbai, Rohilkhand, Oudh and Central India.

Parts Used

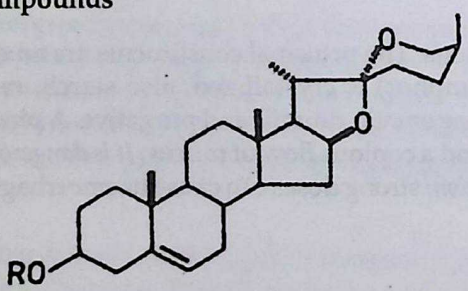
Tuberous root or rhizome decorticated.

Constituents

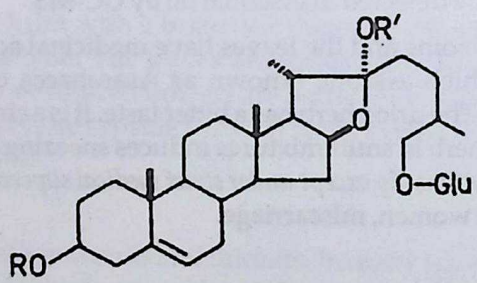
Asparagin, Albuminous matter, mucilage and cellulose. Powdered root is found to contain watery extract, cellulose, moisture and ash, which is 3.6 per cent.

β-Sitosteol, sarsasapogenin and diosgenin isolated from fruits; asparanins A and B, asparosides A and B alongwith sitosterol-β-D-glucoside isolated from fruits and characterised; asparanins C and D and asparosides C and D isolated from roots; adscendins A and B, adscendosides A and B isolated from leaves and their structures elucidated.

New Compounds



Adscendin A
R = Glu(6→1)Rha
Adscendin B
R = Glu[(4→1)Rha](6→1)Rha



Adscendoside A
R= Glu[(4→1)Rha](6→1)Rha,R′ = Me
Adscendoside B
R = Glu[(4→1)Rha](6→1)Rha,R′ = H

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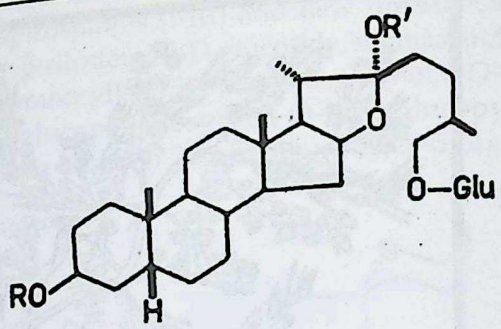
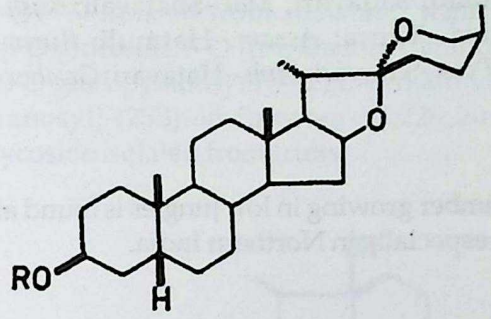


Asperoside A
R = Glu[(2→1)Glu](4→1)Rha,R' = Me
Asperoside B
R = Glu[(2→1)Glu](4→1)Rha,R' = H
Asperoside C
R = Glu[(2→1)Glu][(4→1)Ara]
(6→1)Rha,R' = Me
Asperoside D
R = Glu[(2→1)Glu][(4→1)Ara]
(6→1)Rha,R' = H



Asparanin A
R = Glu(2→1)Glu
Asparanin B
R = Glu[(2→1)Glu](4→1)Rha
Asparanin C
R = Glu[(4→1)Ara](6→1)Rha

Asparanin D
R = Glu[(2→1)Glu][(4→1)Ara](6→1)Rha

Action

Nutritive, tonic, galactegogue and demulcent. Rhizome is bitterish in taste. Colour of the tubers is white and they swell up with water. Tubers have got excellent cooling and demulcent properties.

Preparation

Confection and Powder. The dried tuberous roots obtained in the bazar are known as "safed-musli".

Uses

Tubers boiled in milk and sugar are used in spermatorrhoea, gleet and chronic leucorrhoea; also in diarrhoea, dysentery and general debility. It is used as a substitute for *Salep*. A *compound powder* containing many ingredients is given as a nutritive tonic in doses of from 5 to 30 grains in milk in cases of seminal weakness and impotence.

Asparagus racemosus, Willd.
(Family: Liliaceae)

Vernacular Names

Sans.–Shatavari, Shatamuli (*Shata*–hundred, *Muli*–roots alluding to its numerous fusiform roots); *Hind.*–Shakakul, Satavari; *Ben. & Can.*–Satmuli,Halarru-makkal, Jayibem; *Guj.*–Satavar; *Mah.*–Satavari-mull; *Tam.*–Kilavari, Tannirvittankizhangu, Sadavari, Shimai Shadavari; Paniyanaku; *Tel.*–Philli-taga,

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Challa-gaddalu, Sadavari; *Mal.*–Shatavali; *Kash.*–Sejhana; *Sind.*–Tilora; *Assam.*–Hatmuli; *Burm.*–Kanyo-mi; *Pers.*–Satavari; *Sinh.*–Hatavari; *Gwalior.*–Sitawar.

Asparagus racemosus

Habitat

This climber growing in low jungles is found all over India, especially in Northern India.

Parts Used

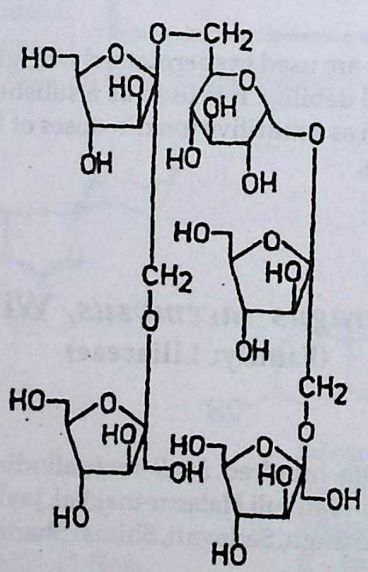
Roots and leaves.

Constituents

Large amount of saccharine matter and mucilage.

A new pentasaccharide (I) constituted of one sucrose and four fructofuranose units and five related oligosaccharides isolated from roots; α- and β-aspartylaspartic acid, α-aspartylglutamic acid, γ-glutamylaspartic acid, γ-glutamylglutamic acid, γ-glutamyltyrosine, S-(2-carboxypropyl)-L-cysteine and S-(1,2-dicarboxyethyl)-L-cysteine present in shoots; a new amino acid–N-carboxymethyl-L-serine–isolated from shoots; a mixed disulphide of S-(2-carboxy-3-mercaptopropyJ)-L-cysteine and 3-mercaptoisobutyric acid and disulphide of S-(2-carboxy-3-mercaptopropyl) cysteine isolated and their structures established; two novel nonreducing hexasaccharides constituted of a sucrose and five fructofuranose units isolated from roots; seed oil (15.3%) comprised of stearic (3.59), palmitic (11.52), arachidic (43.47), oleic (22.16), behenic (5.78), linoleic (11.34) and linolenic (2.14%) acids; unsaponifiable matter (1.43%) consisted of β-sitosterol.

New Compounds



I

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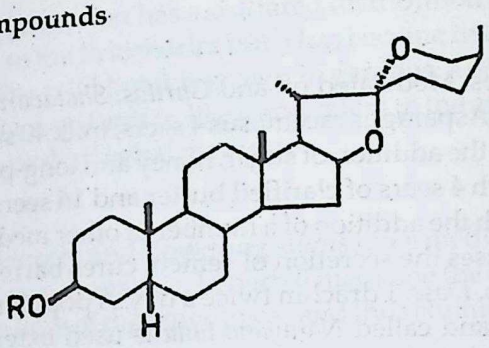
New spirostanols (I-III) and new furostanols (IV-V) isolated from roots and their structures determined; β-sitosterol-β-D-glucoside, stigmasterol-β-D-glucoside, 3-O-[α-L-rhamnopyranosyl-(1→4)-β-D-glucopyranosyl]-(25S)-5β-spirostan-3β-ol, 3-O-[β-D-glucopyranosyl-(1→2)[α-L-rhamnopyranosyl (1→4)-β-D-glucopyranosyl]-26-O-[β-D-glucopyranosyl]-(25S)-5β-furostan-3β,22α,26-triol and corresponding furostan-22α-methoxy-3β,26-diol glycoside isolated from fruits.

New Compounds



I

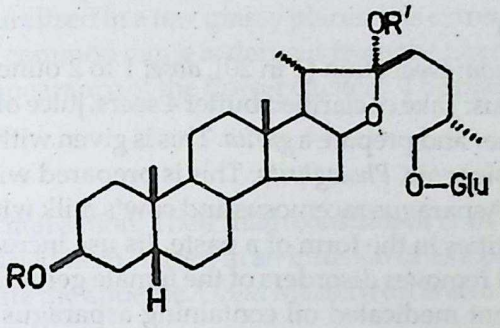
R = Glu(4→1)Ara

II

R = Glu[(2→1)Rha](4→1)Ara

III

R = Glu[(2→1)Glu](4→1)Ara



IV

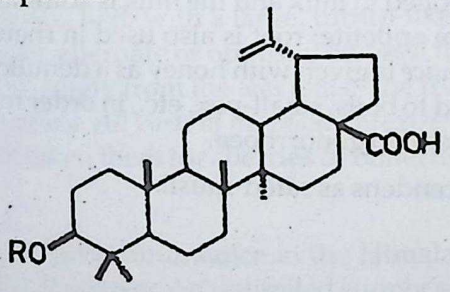
R = Glu[(2→1)Glu](4→1)Ara, R' = Me

V

R = Glu[(2→1)Glu](4→1)Ara, R' = H

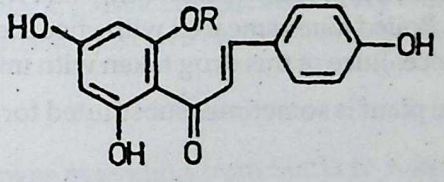
New saponin (I) isolated from aerial parts and characterised; chalcode glycoside (II) along with apigenin, rutin and 4,4',6-trihydroxyaurone; its structure elucidated.

New Compounds



I

R = Rha(2→1)Glu



II

R = Glu(4→1)Rha

Action

Root is highly mucilagenous, antidiarrhoetic, refrigerant, diuretic, antidysenteric, nutritive, tonic, demulcent, galactagogue, aphrodisiac and antispasmodic.

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Action and Uses in Ayurveda and Siddha

Madhura rasam, Madhura vipakam, seeta-veeryam; polyuria, chronic fevers, soma rogam, white discharge, internal heat, tonic.

Action and Uses in Unani

Hot 1°, Moist 2°, aphrodisiac, stomachic, tonic, gonorrhoea.

Preparation

Confection: Decoction (1 in 20), *dose*: 1 to 2 ounces. Medicated oil and *Ghritas. Shatavari ghrita* is prepared thus: Take of clarified butter 4 seers, juice of Asparagus racemosus 4 seers, milk 40 seers; boil them together and prepare a *ghrita*. This is given with the addition of sugar, honey and long-pepper as an aphrodisic tonic. *Phalaghrita:* This is prepared with 4 seers of clarified butter and 16 seers each of the juice of Asparagus racemosus and cow's milk with the addition of a number of other medicines in small quantities in the form of a paste. Its use increases the secretion of semen, cures barrenness in women and removes disorders of the female genitals. *Dose*: 1 drachm twice a day. A popular cooling and emollient medicated oil containing asparagus and called *Narayana taila* is used externally in rheumatism, diseases of the joints, stiff-neck, hemiplegia and other disease of the nervous system. *Vishnu taila*, an oil much used in nervous diseases and prepared with sesamum oil, cow's or goat's milk and the juice of Asparagus racemosus with the addition of a number of substances in small quantities in the form of a paste, and *Prameha Mihira Taila* which is prepared with the juice of Asparagus racemosus, sesamum oil, decoction of lac, whey and milk with the addition of a number of substances in the form of a paste are very useful applications.

They are rubbed on the body and more particularly on the public region in chronic gonorrhoea, stricture of the urethra and other diseases of the urinary organs.

Uses

Root is employed in diarrhoea as well as in cases of chronic colic and dysentery. *Root* boiled with some bland oil, is used in various skill diseases. *Root* is boiled in milk and the milk is administered to relieve bilious dyspepsia and diarrhoea and to promote appetite; root is also used in rheumatism. *Tubers* are candied and taken as a sweetmeat. *Fresh root-juice* is given with honey as a demulcent; *bark* is poisonous. Boiled *leaves* smeared with ghee are applied to boils, small-pox, etc., in order to prevent their confluence. Juice of this drug taken with milk is useful in gonorrhoea.

N.B.–The plant is sometimes substituted for A. adscendens as safed-musli.

Astrantia major
(Family: Umbelliferae)

Vernacular Name

Eng.–Great masterwort.

Botanical Description

A perennial herb with a black, woody; rhizome and an erect, slightly branched stem. The basal leaves, arranged in a rosette, are long-stalked, shiny dark green, palmately lobed and coarsely toothed.

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The stem leaves are similar but smaller. The white, pinkish or greenish flowers are clustered in simple rounded umbels, which are surrounded by a conspicuous white or reddish whorl of petal-like involucral bracts. The fruit is an oblong achene with a comb-like keel. Although the plant is aromatic it is also *poisonous*.

Habitat

Great Masterwort has a scattered distribution in Europe in Alpine meadows and open woods. It is not native to the British Isles but it has become naturalized in a few grassy places. It is extremely rare to find it in the wild but it is grown in gardens. The common name is derived from the Greek words *astron* (= a star) and *anti* (= like), and refers to the appearance of the flower clusters. The plant is now only rarely used in herbal medicine.

Uses

The rhizomes and flowering stems have medicinal action. Their main constituent is an essential oil that acts as a stomachic. In herbal medicine the dried herb is used in an infusion or as a powder to promote the flow of digestive juices and thus stimulate the appetite. Great Masterwort is also included in diuretic tea mixtures.

Atropa belladonna, Linn.
(Family: Solanaceae)

Vernacular Names

Eng.–Deadly nightshade; *Hind.*–Sag-angur or Angurshefa; *Ben.*–Yebruj; *Bom.*–Girbuti.

Botanical Description

A perennial herb with a large, turnip-like root and spreading, branched stems. The large, soft, oval leaves are alternate or opposite where a flower arises. The stalked, bell-shaped, reddish-brown flowers grow singly from the leaf axils. The fruit is a black, glossy, conspicuous berry cupped by the spreading sepals. *All parts of the plant are extremely poisonous;* just two or three berries can kill a child who has mistaken them for cherries or bilberries.

Habitat

Grows in great abundance in the Himalayan ranges extending from Simla to Kashmir, and is found wild in Kunawar. An unlimited supply of the root can be obtained from the northern Himalayas. Also obtainable in the hilly regions of India. Considerable quantities of the roots could be grown in various suitable situations in India.

Deadly Nightshade is found throughout Europe in hedges, woods and thickets and in waste places, especially on lime-rich soils. In the British Isles it is sometimes found growing wild in England and Wales; elsewhere it has been introduced. It is grown as a field crop for the pharmaceutical industry in several countries, but only on a small scale in Britain. In Greek mythology Atropos is one of the three Fates who severs the thread of life; the Greek word *atropos* means unchangeable or irrevocable. It is said that fashionable Italian women used the juice of Deadly Nightshade berries to dilate the pupils of their eyes and it is this practice that gave the plant its specific name, *belladonna*, meaning 'a fair lady' in Italian. (It is actually dangerous to use the juice in this way because doing so can cause glaucoma.)

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Constituents

A process for extracting (-)hyoscyamine developed; atropine synthesised.

Indian belladonna root contains a higher proportion of alkaloid atropine and hyoscyansine than the European varities. A number of specimens of the roots contained 0.81 per cent of total alkaloids, as compared with 0.45 per cent laid down in the British Pharmacopoeia, and the leaves contained 0.50 per cent as compared with 0.3 per cent.

Atropa belladonna

Biological Activity

Atropine decreased lower oesophageal sphincter pressure significantly at 5 min after i.v. injection and this change was sustained for 1 hr in healthy volunteers; in normal adult volunteers, decrease in leftward lower oesophageal sphincter pressure with atropine was more marked (40%) than rightward (20%). The result of this differential response to atropine was to reduce right-left pressure asymmetry. Mean highest leftward pressure fell 15-30 min post-injection from 35 to 21 mm and mean highest rightward pressure fell from 22 to 18 mm; atropine sulphate (0.1-0.8 µMol) injected into rat hind limb perfusion circuit, showed dose-dependent decrease in perfusion pressure which was immediate in onset and always preceded systemic pressure changes. Duration of vasodilation lengthened with increasing doses of atropine and ranged from 1.5 to 9 min. During atropine-induced vasodilation, challenging doses of acetylcholine did not alter perfusion pressure. Peripheral vascular effects of intra-arterially (i.a.) injected atropine sulphate and atropine methyl bromide in autoperfused hind limbs of rats, showed that the former (0.1-0.8 µMol) decreased perfusion pressure whereas the latter (0.1-1.6 µMol) increased it. Responses were immediate on i.a. injection and were dose-related. Data indicated that vasoconstrictor action of both drugs did not appear by activation of vascular α-adrenergic receptors.

Atropine (4 mg/kg/day, i.p.) for 10-15 days after 33 weeks of chronic barbital treatment in rats, showed increased tolerance to hexobarbital; atropine (20 and 50 mg/kg, i.p.) given to rats 20 min before or immediately after training markedly inhibited learning and/or retention in training and memory testing experiments; further, after atropine administration central stimulants did not exert their memory improving effect. Methylatropine, on the other hand, in similar doses applied alone or together with central stimulants influenced neither memory processes nor memory-improving effect of central stimulants; in normal subjects, atropine (0.85 mg, p.o.) impaired short-term memory, flicker recognition, coordination and standing steadiness, whereas higher dose of atropine (1.7 mg) had greater effect on these parameters and also affected reaction speed. Central effects of atropine were maximal at 1 hr after its administration, while peripheral effects were maximal after 2-4 hr. Its acute psychomotor effects are less than those of anxiolytics, neuroleptics or antidepressants.

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Atropine was injected i.v. into rabbits, rats and guinea pigs and their effects on atrioventricular node were studied. In most cases it dose-dependently repressed vagal bradycardia but in some animals it was increased; duration of repression varied with animal species. Arrhythmia was also produced by atropine; effect of pretreatment with inhaled atropine methonitrate (1.5 mg) and placebo was compared on standardised inhalation challenges with histamine in normal and asthmatic human subjects and with antigen in atopic asthmatics. It was concluded that atropine was a powerful bronchodilator, particularly in atopic asthmatics with increased bronchomotor tone. Histamine- and antigen-induced bronchoconstriction was inhibited by atropine but extent of this inhibition varied between subjects; atropine inhibited cholinergically-induced gastric acid secretion and gastric motility in isolated perfused stomach of mouse. Inhibition of gastric acid secretion by atropine occurred at dose-range of 1-2nM; in isolated rat diaphragm-nerve preparation atropine (0.01-0.25 gm%) slightly stimulated contraction induced by indirect stimulation followed by gradual decrease and finally blockade; atropine effect was reversed by washing with drug-free solution. Atropine induced increased in outward movement of Na^+ in muscle followed by subsequent decrease; scopolamine exhibited central nervous system depressant but atropine showed stimulant activity in conscious rabbits after intracerebroventricular injection.

Parts Used

Atropine alkaloid extracted from roots and leaves. Fresh leaves and branches are used in the preparation of extract of belladonna.

The dried leaves and roots are used medicinally. They include various potent alkaloids such as hyoscyamine, atropine, belladonnine and scopolamine. These substances particularly affect the parasympathetic nervous system and are used together or in isolated form in proprietary and homeopathic medicines prescribed by medical practitioners as antispasmodics, sedatives and analgesics and as antidotes to various poisons. Atropine is used in ophthalmology. *Deadly Nightshade is highly dangerous and it should never be collected and used for self-medication.* Even a small dose can be fatal.

Action

Belladonna is a powerful drug. It and its alkaloid atropine are largely used in western medicine as a sedative, antispasmodic, anodyne and mydriatic in diseases of the eye.

Preparation

Foreigners and Indian manufacturing firms prepare many galenicals and alkaloids from the Indian belladonna roots and leaves.

Uses

Belladonna is a valuable antidote in poisoning by opium, muscarine, etc. Extract of belladonna is used as an external application to believe pain, and internally for checking excessive perspiration in consumption, for the relief of coughs, and for many other purposes. The extract prepared from the leaves causes the pupil of the eye to dilate, and is used in ophthalmic surgery.

Remarks

A variety known as lutescens with a low alkaloidal content has frequently been substituted and adulterated while exporting belladonna plants from India to foreign countries to the great disadvantage of Indian export trade.

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Avena sativa, Linn. or *A. orientalis*

(Family: Gramineae)

Vernacular Names

Eng.–Oats; *Mah.*–Jai.

Botanical Description

An annual herb grown as an important cereal crops. The hollow, jointed stems (culms) bear terminal, panicle-like flowerheads. The leaves are long and narrow with a sheath clasping the stem and a large ligule (a strap of tissue at the base of the leaf). Each part (spikelet) of the drooping flowerhead contains two or three florets enclosed by two chaff-like bracts (glumes). The lower bract (lemma) usually does not have an awn–a bristle-like projection–unlike the Wild Oat (*A. fatua*), which does. The small hard fruit is the familiar grain.

Habitat

Britain and America. Grown in military grass-farms of Northern and Western India. Available in Indian Bazzars, as also in many other countries.

Common Oat is native to eastern Europe but it has been cultivated since Classical times and is now grown throughout the world except in the tropics. It is cultivated most in northern countries. Wild Oat is also not indigenous to the British Isles but it and Common Oat can sometimes be found growing wild as weeds of arable fields and waste ground. The name Oat is derived from an Anglo-Saxon word *ate*, of unknown origin

Parts Used

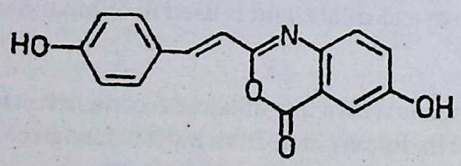
Seed or the grain and its meal (oatmeal).

Constituents

Fat, starch, sugar, albumin soluble and insoluble, cellulose, mineral matter and moisture. Outer portion of the grain contains phosphates. Seed contains a principle called "avenin" the nitrogenous principle of Avena sativa and somewhat resembles legumin. Ritthausen considers Nortin's Avenin to have been a mixture of legumin or vegetable casein and 2 vegetable gluten containing sulphur to which he gives the name "Giladin", the legumin however predominating. As 50 mg in 100 g fresh plant and 62 mg in dry.

Avenalumin I isolated from leaves and its structure determined; 1,3,4-pentanetricarboxylic acid trimethyl ester identified from husks; nicotianamine along with avenic acid A and its derivatives isolated from seedlings; esters (21.1), hydrocarbons (15.5) and free acids (14.1%) determined in seed epicuticular wax; 2β-D-glucopyranosyloxy-2-methylpropionitrile (linamarin) identified from seedlings.

New Compounds



Avenalumin I

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Biological Activity

1,3,4-Pentanetricarboxylic acid trimethyl ester exhibited germination-inhibiting activity.

The grains and sometimes the dry stalks (straw) are used medicinally. The grains contain valuable proteins, sugars, fat, starch, vitamin B complex, pigments (carotenes) and various minerals, among them iron, calcium and potassium salts. Rolled oats can be made into nourishing soups and porridge for convalescents and they also control diarrhoea. Oat tea stimulates the appetite, soothes throat and chest pains and is a nerve tonic in cases of mental fatigue, anxiety and insomnia. Externally fine oatmeal can be used as a cleansing and soothing poultice, or bath preparation. The straw can also be used as a bath preparation to treat rheumatic pains and sciatica and it is a skin tonic.

Preparation

In America a tincture is made from it. Generally it is used as food in various forms–meal, malt, porridge, Blanc-mange etc. In Homoeopathic medical system, tinctures are made from oat seeds or grains, and from fresh entire plant, respectively.

Action

A most nutritious cereal containing a fair proportion of all the food-elements. But it should not be used as the *sole* article of diet for a long time even with the addition of milk, on account of its tendency to produce skin-eruptions due to the irritating qualities of "avenin", one of its ingredients. As tincture it is a nerve stimulant.

Uses

It is most useful as a nutrient and is described as a perfect food. This is an unrivalled fodder crop for horses in India. British grown oats are best. Oatmeal *porridge* does not agree with everyone. In cases where the bodily vigour is low and the body ill-nourished, *creamed* Oatmeal, or Oatmeal *Blanc-mange* is very valuable. In the form of *tincture* (of the green oats) it is recommended for all liable to much nervous strain. The dose is from 10 to 20 drops in a little hot water taken twice a day; in a dose of 4° drops as a saporific, as an antidote in morphinism, alcoholism, dyphtheric paralysis (in rather smaller dosage), also in dysentery (for nocturnal restlessness), oatmeal may be advantageously used in lieu of soap by dry skinned people. Oatmeal can be baked into "cake" or "biscuit", but owing to the difficulty of rupturing the starch grains; contained in it, except at very high temperatures, the meal does not lend itself to bread-making. The food known as "Quaker Oats", is also prepared from oat grains.

Bacopa monnieri
(Family: Scrophulariaceae)

Botanical Description

Creeping, glabrous, somewhat succulent herb; rooting at nodes; leaves simple, opposite, obovate-oblong, obtuse, entire, to 2 × 1 cm; flowers pale violet, axillary, solitary on long pedicles; calyx 5-partite, lobes unequal; corolla gamopetalous, funnel-like, white or pinkish with purple blotches; stamens 4, didynamous, included; ovary 2-chambered; ovules many on swollen axile placenta; capsules ovoid, included in the persistent calyx.

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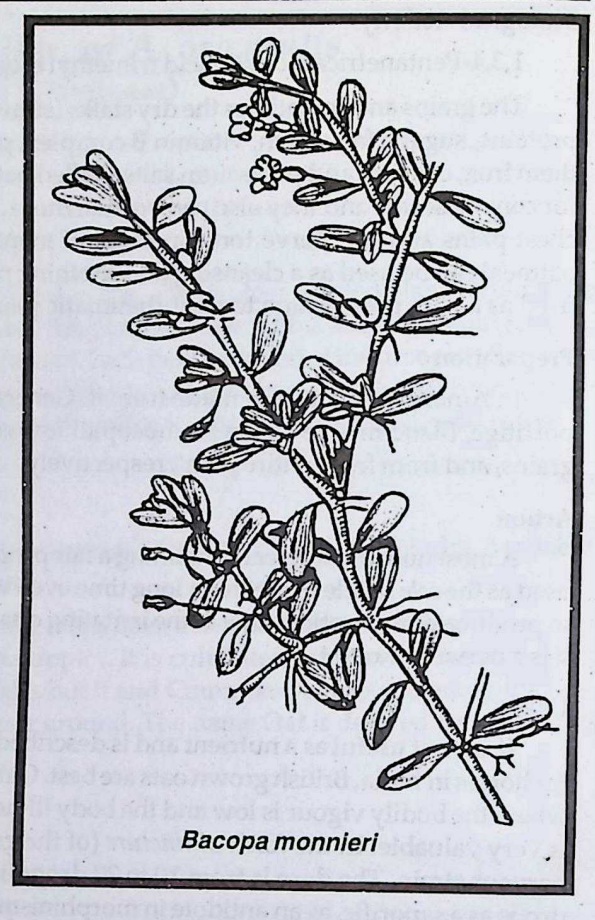
Constituents

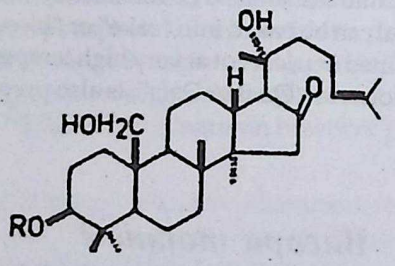
Total alkaloidal fraction, LD50 8.5 mg/100g in mice (i.p.), stimulated autonomic ganglia followed by blockade, produced spasm of the skeletal muscle, stimulated respiration followed by depression, showed tachyphylaxis and produced rigidity and convulsions in mice; behavioural effects of active fraction suggested that it had tranquillising property which was much weaker than that of chlorpromazine. It did not block significantly conditioned avoidance response in rats even at high doses but offered graded protection against audiogenic seizure in mice and antagonised mescaline scratch response in mice.

An amorph. substance, mp. 71°, betulinic acid, D-mannitol, and a glycoside, mp. 275°, containing glucose and arabinose, isolated; two saponins–bacoside A, mp. 250° and bacoside B, mp. 203°–stigmastenol, β-sitosterol, stigmasterol in addition to mannitol and betulinic acid isolated; structures of bacoside A and bacoside B assigned as 3-(α-L-arabinopyranosyl)-O-β-D-glucopyranoside-10,20-dihydroxy-16-ket-dammer-24-ene; these differ only in optical rotation; another saponin–monnierin–isolated and its structure assigned; nicotine detected by PC in alcoholic extract.



Bacopa monnieri

New Compounds



Bacoside A
R = Glu-Ara

Biological Activity

Hersaponin mainly exhibited sedative action in mice (i.p.). It did not protect rats against electric shock or mice against metrazole seizures nor did it diminish metrazole toxicity. It reduced amphetamine toxicity in mice. It potentiated hypnotic effects of hexobarbital, pentobarbital and EtOH in mice; maximum potentiation observed when it was administered 15 min. prior to other compounds.

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Uses

Brahmi is an important *medhya* drug in Ayurveda for improvement of intelligence and memory and revitalisation of sense organs. It is also capable of imparting youthful vitality and longevity. It clears voice and improves digestion. The drug is reported to be cold, sweet, astringent, diuretic, laxative and a tonic for heart and nerves. It is indicated against dermatosis, anaemia diabetes cough, dropsy, fever, arthritis, anorexia, dyspepsia, emaciation and insanity. It dispels poisonous affections, splenic disorders and impurity of blood. The whole plant is used in a variety of preparations like *Brahmighrtam, Sarasvataristam, Brahmitailam, Misrakasneham*, etc.

Baliospermum axillare or *B. montanum* or *Jatropha montana*
(Family: Euphorbiaceae)

Vernacular Names

Sans.–Danti-nana; *Hind.*–Hakni; *Beng.*–Danti; U.P.–Jangli-jamalgota; *Bom.*–Dantimul; *Tam.*–Nagadanti; *Tel.*–Adavi-amudan; *Arab.*–Hab-bussala; *Pers.*–Bedanjire-khatai; *Lepcha*–Poguntig; *Burm.*–Tha-du-wa.

Habitat

It is found in tropical Himalayas, Deccan, Bengal, N. Circars and Burma. Roots contains resin and starch.

Parts Used

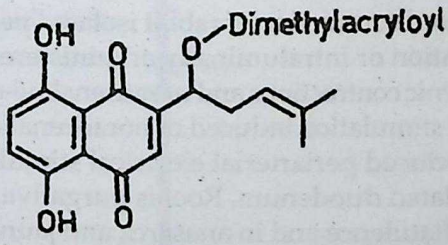
Leaves, seeds and root.

Constituents

Ash of seeds (4.38%) contained Ca, Mg, Na, K and traces of P; presence of oleic, linoleic, myristic, palmitic, stearic, arachidic acids and sitosterol; detection of glucose, arabinose, xylose and rhamnose in seeds by PC.

Major pigment of plant was characterised as 3,3-dimethylacryloylshikonin.

New Compounds



3,3-Dimethylacryloylshikonin

A coumarino-lignan (I) isolated from roots and its structure determined; jatropholone A and fraxetin also isolated.

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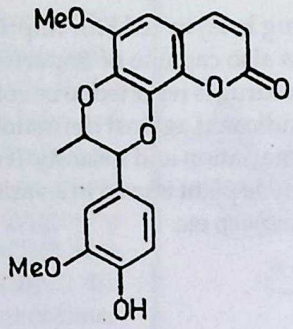
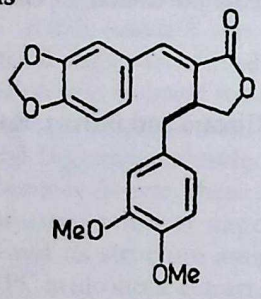
New Compounds



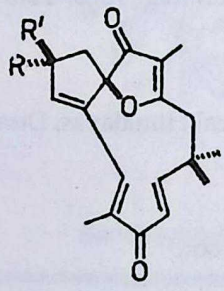
I

Structure of a new lignan–2-piperonylidene-3-verytryl-3R-γ-butyrolactone (I)–confirmed by X-ray analysis; seed oil contained saturated acids (73.8%) in which palmitic acid was predominant (31.4%); 2α-hydroxyjatrophone, 2β-hydroxyjatrophone and 2β-hydroxy-5,6-isojatrophone isolated from roots and their structures determined.

New Compounds



I



2α-Hydroxyjatrophone
R = OH, R' = Me
2β-Hydroxyjatrophone
R = Me, R' = OH

Biological Activity

Tetramethylpyrazine inhibited contraction of rabbit isolated perfused central ear artery induced by periarterial electrical stimulation or intraluminally administered noradrenaline. It also reduced amplitude of spontaneous myogenic contractions and noradrenaline-evoked contractions of rat isolated portal vein. It inhibited electrical stimulation induced or noradrenaline-evoked contractions of guinea pig isolated vas deferens and reduced periarterial electrical stimulation induced or noradrenaline-evoked relaxations of rabbit isolated duodenum. Root is purgative, often used in combination with aromatics, in constipation with flatulence and in anasarca and jaundice. *Seeds* have properties more or less similar to Croton tiglium, and are drastic purgative, and given with *trikatu* and *kankankhara*. *Dose* is one seed of 1 to 3 grains. Locally seeds act as stimulant and rubefacient. Following are two useful Home Remedies: (1) *Naracha Rasa*: Take seeds of Baliospermum montanum 9 parts, mercury, borax and black pepper, one part each, sulphur, ginger and long pepper two parts each; powder the ingredients and make into two-grain pills with water. These are given in constipation and tympanites. (2) *Gudashtaka*: Take of *Danti*, *trivrit* and plumbago roots, black pepper, long pepper, ginger and long

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pepper root, equal parts in fine powder; treacle, equal in weight to all the other ingredients and mix. Dose is about a tola every morning in flatulence and retained secretions, anasarca, jaundice, etc. Root is sold as "dantimul" by drug- dealers. Root and leaves have similar properties and are used in the indigenous medicine in dropsy and general anasarca. *Expressed juice of young leaves* applied to a bleeding cut or bruise, and leaves applied as bandage, stops haemorrhage, prevents suppuration and heals the wound.

Action

Seeds are employed as drastic purgative; locally seeds act as stimulant and rubifacient.

Uses

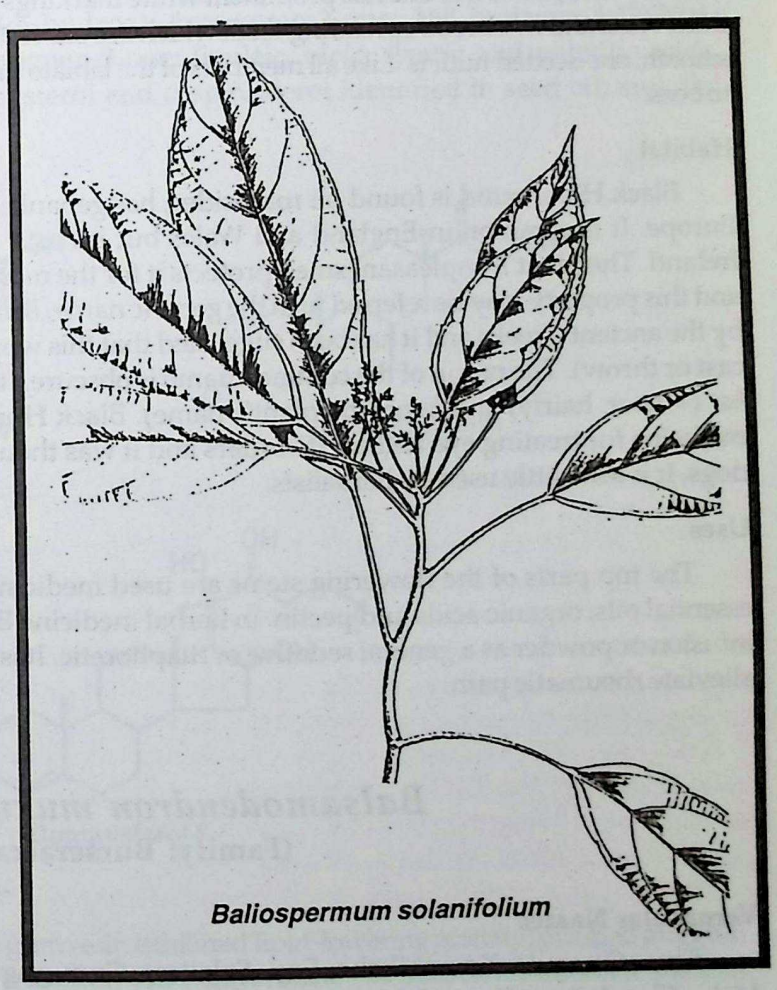
Roots and *Leaves* have similar properties and are used in the indigenous medicine in dropsy and general anasarca. *Root and seeds are purgative* and are used in snake-bite. Leaves are used in asthma.

Baliospermum solanifolium

(Family: Euphorbiaceae)

Botanical Description

Stout shrubs; leaves simple, alternate, with two glands at the base, variable in size and shape, lower ones long-petioled, petiole upto 17-18 cms, blade 3-5 lobed, or coarsely toothed, to 23 × 20 cms, upper one smaller, ovate or lanceolate, acuminate, subentire, scabrous; flowers unisexual, small, greenish, in axillary monoecious fascicles; male flowers; perianth of 5 orbicular-concave lobes; stamens numerous on a central receptacle. Female flowers: calyx lobes 5, lanceolate, accrescent in fruit; ovary hairy outside, 3-celled, 3-ovuled, styles 3, each 2-fid; fruit a capsule separating into 3 cocci.



Baliospermum solanifolium

Habitat

Peninsular India.

Uses

The drugs forms an important constituent of preparations lie *Dantyaristam*, *Dantiharitakilcham*, *Kaisoraguggulu gulika*, etc. Root, which

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is the officinal part, is purgative, anthelmintic, carminative, rubefacient and anodyne. It is used in abdominal pain, constipation, calculus, general anasarca, piles, helminthic manifestations, scabies, skin disorders, suppurative ulcers and diseases caused by the morbidity of *kapha* and *pitta*. Root paste is applied to painful swellings and piles. Leaves cure asthma and seeds are used in snake-bite.

Ballota nigra
(Family: Labiatae/Lamiaceae)

Vernacular Name

Eng.–Black Horehou.

Botanical Description

A perennial herb with a short, stout rhizome and with erect or ascending, branched, square and leafy stems. The leaves are opposite, stalked, wrinkled and coarsely crenate-serrate. All parts of the plant are hairy and have a strong, disagreeable smell and taste. The pinkish-purple, sometimes white flowers are arranged in numerous whorls in the upper leaf axils. The corolla has two lips; the upper one is hooded, the lower one has prominent white markings on it. The calyx is funnel-shaped with five thick veins and five broad spreading teeth which are curved back in the fruit. The fruit consists of four smooth, one-seeded nutlets. Like all members of the labiate (mint) family Black Hore-hound is attractive to bees.

Habitat

Black Horehound is found on road-sides, hedgebanks and in waste places throughout most of Europe. It is common in England and Wales but it has a more local distribution in Scotland and Ireland. The plant's unpleasant smell protects it for the most part from being eaten by farm animals, and this property may be referred to in the generic name, *Ballota*. The plant was originally called *ballote* by the ancient Greeks and it has been suggested that this word comes from the Greek *ballo* (= to reject, cast or throw). The origin of the common name is obscure. It may come from the Anglo-Saxon words *har* (= hoar, hairly) and *hune* (the plant's name). Black Horehound has long been used as a herbal medicine for treating eye and ear disorders and it was thought to be an antidote for bites from mad dogs. It is now little used by herbalists.

Uses

The top parts of the flowering stems are used medicinally. The main constituents are tannins, essential oils, organic acids and pectin. In herbal medicine Black Horehound is used internally in an infusion or powder as a general sedative or diaphoretic. It is also applied externally as a compress to alleviate rheumatic pain.

Balsamodendron mukul, Hook.
(Family: Burseraccae)

Vernacular Names

Sans.–Guggula, Kou-shikaha; *Eng.*–Salaitree, Gum-gugul, Indian bedellium; *Hind., Duk., Tel. & Mah.*– Gugal; *Ben.*–Guggul, Mukul; *Can.*–Guggula; *Tam.*–Gukkulu, Gukkal, Maisatchi Kungiliyam;

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Tel.–Maishakshi, Gukkulu; *Guj.*–Gugara, Gugal; *Arab.*–Mogla, Moql, Mokhil, Aphalatana; *Pers.*–Baijahundana; *Sinh.*–Rata-dummula.

Habitat

Sind, Rajputana, Eastern Bengal, Berars, Assam, Khandesh and Mysore.

Characteristics

When fresh the oleo-gum-resin is moist, viscid, fragrant and of a golden colour. It burns in fire, melts in the sun, and forms a milky emulsion with hot water.

Parts Used

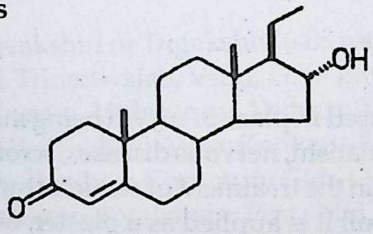
Gum.

Constituents

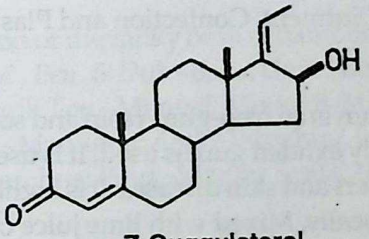
Volatile oil, gum-resin and bitter principle.

Stereochemistry or guggulsterol-1 determined by X-ray analysis as 20R, 22R which was different from that reported earlier; quercetin, quercetin-3-O-α-L-arabinoside, quercetin-3-0-β-D-galactoside, quercetin-3-O-α-L-rhamnoside, quercetin-3-O-β-D-glucuronide, ellagic acid and pelargonidin-3,5-di-O-glucoside isolated from flowers; guggulsterol-VI and Z-guggulsterol isolated from gum resin along with 20α-hydroxy-4-pregnen-3-one, 20β-hydroxy-4-pregnen-3-one, 16β-hydroxy-4,17(20z)-pregnadien-3-one and 16α-hydroxy-4-pregnen-3-one; linoleic, oleic, stearic and palmitic acids, sitosterol, stigmasterol, cholesterol, campesterol and α-spinasterol identified in seed oil; mukulol synthesised.

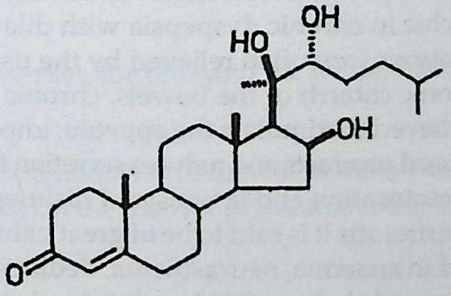
New Compounds



Guggulsterol-VI



Z-Guggulsterol



Guggulsterol-I

Biological Activity

An unidentified compound from oleo gum resin exhibited lipid-lowering activity; purified guggulu steroid mixture at 0.2 mM completely inhibited ADP-adrenaline- or serotonin-induced platelet aggregation.

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Action

Demulcent, aperient, alterative, carminative, antispasmodic and emmenagogue. The pharmacological action of the oleoresin resembles in many ways the action of copaiba and cubebs. It has no action on the unbroken skin, but on the abraded skin and on the mucous membranes, it acts as an astringent and antiseptic. When taken internally it acts as a bitter, stomachic and carminative, stimulating the appetite and improving the digestion. It produces a sensation of warmth in the stomach and is quickly absorbed. Like all oleo-resins it causes an increase of leucocytes in the blood and stimulates phagocytosis. It is excreted by the skin, mucous membranes and the kidneys, and in the course of its excretion it stimulates them and disinfects their secretions. It acts as diaphoretic, stimulating expectorant and diuretic. It is also said to be an uterine stimulant and an emmenagogue, and regulates the menstrual functions. It is quite harmless and may be taken for a long time without any ill-effects. It sometimes produces an erythematous rash like copaiba, and rarely symptoms of kidney irritation may appear, but these rapidly disappear when the drug is omitted. Gugul is said to have marked antisuppurative properties: it is believed to be a valuable aphrodisiac.

Action and Uses in Ayurveda and Siddha

Tikta kashaya rasam, katu vipaka, vata kapha haram, pitta karam, lagu, saram, dipanam, ruksham, balyam, rasayanam, vrishyam, bhagnasanthana karam. In vranam, apachi, arsas, granthi and in skin diseases.

Action and Uses in Unani

Hot 3°, Dry 2°, resolved in piles, cough due to moisture, purgative of balgham, dries the ruthobath.

Preparation

Paste or Ointment. Confection and Plaster.

Uses

Guggul gum is an oleo-gum-resin and sometimes used in place of myrrh being much cheaper, and fresh or recently exuded gum is used. It is used in rheumatism, nervous diseases, scrofulous affections, urinary disorders and skin diseases. It is highly reputed in the treatment of rheumatism given internally and applied locally. Mixed with lime juice or coconut oil it is applied as a plaster, or in the form of a lotion in indolent ulcers and bad wounds, and the lotion as a gargle in caries of the teeth, weak and spongy gums, pyrorrhoea alveclaris, chronic tonsillitis and pharyngitis and ulcerated throat. A drachm of the tincture (20 per cent in 90 per cent alcohol) in 10 ounces of water makes a useful lotion and gargle. It is used as a stomachic in chronic dyspepsia with dilatation and atony of the walls of the stomach. Troublesome borborygmi are often relieved by the use of this oleo-resin. As an intestinal disinfectant it is used in chronic catarrh of the bowels, chronic colitis, tubercular ulceration of the bowels and diarrhoea. It is believed to stimulate the appetite, improves the general condition, reduces fever, causes absorption of effused products and reduces secretion from diseased surfaces. In pulmonary tuberculosis it stimulates expectoration and lessens and disinfects the sputum. In pleural effusions and in ascites of tubercular peritonitis it is said to be of great value. In marasmus of children it is said to be of value and is also used in anaemia, neurasthenia, debility and allied conditions. Gugul given in large doses every 4 or 6 hours is believed to be useful in laryngitis, bronchitis, pneumonia and whooping cough. It is often combined with salicylate of sodium. It is said to improve the general condition of the patient in leprosy, relieves lassitude, gives a sense of well-being, and relieves the nervous pains that are so very common in this disease. In pyelitis, cystitis and gonorrhoea it is useful

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after acute symptoms have subsided. In chronic endometritis, amenorrhoea and menorrhagia it is particularly valued. Administered in large doses it is said to be useful in leucorrhoea. Inhalations of the fumes of burnt gugul are given in hay fever, acute and chronic nasal catarrh, chronic laryngitis, chronic bronchitis and phthisis. The beneficial effects of the drug in many of the above conditions can be explained by the presence of the oleo-resin which contains active aromatic substances. Gum obtained from another species–B. Pubescens found in Sind, Karachi and Baluchistan is used as ointment in bad ulcers such as Delhi sores, combined with sulphur, catechu and borax. As plaster it is applied in hiccough on the pit of the stomach, where it acts instantly. A preparation called *Yoga-raja guggla* is a favourite one in rheumatism and it is composed of several ingredients. Another preparation similar in composition is *Trayodasang guggula* which is made with 13 aromatic adjuncts and is recommended for use in rheumatism (lumbago) affecting the loins and the sacrum. In rheumatism affecting the joints and bones a preparation called *Aditypaka guggula* is used. Other preparations are *Vatari raja, Kaisara guggula, Sasanga guggula, Amrita guggula* and *Kanchanara guggula. Triphala guggula* is a simple household remedy most useful in gonorrhoea, dropsy, fistula, foul ulcers, syphilis etc. It is prepared by taking of *guggula* 5, *triphala* 3, *pipali* 1 and honey sufficient to make a pill mass after mixing all together. *Dose*: 5 grs.

Bambusa arundinacea, Retz.
(Family: Gramineae)

Vernacular Names

Sans.–Vansa, Tavakshiri or Tugakshiri (silicious concretion or the milky bark of bamboo), Vamnsa-lavanum, Vaishnavi, Trinadwajab, Venu; *Eng.*–Bamboo; *Hind., Ben. & Duk.*–Bans; *Guj.*–Wans, Kapura; *Tel.*–Bonga, Vedurubeeam, Vederuppu, Veduru; *Mal.*–Moongil; *Tam.*–Mangal, Moongil, Moongilarisi, Moongiluppu; *Can.*–Bedru; *Kon.*–Vaso; Konkan.–Kalak; *Mah.*–Mandgay; *Arab.*–Tabashira, (concretion), Qasab (bamboo); *Fr.*–Bambou-Commun; *Guj.*–Gemeiner Bambos; *Punj.*–Magar; *Santal.*–Mat; *Sinh.*–Una; Assam.–Bnah; *Burm.*–Kyakatwa; *Pers.*–Nai, Tabasheer.

Habitat

Common in Central and South India, cultivated in Bengal and North-Western India.

Varieties

Two varieties are available in the market, the blue and the white, both having a sweet taste.

Parts Used

The interior stalks or stems (bamboo hollows) of female plant containing silicious concretions (deposit) called *tabashir* (bamboo manna) in the interior of the stem of B. arundinacea; young shoots, leaves, articulations, seeds and roots.

Constituents

Tabashir ('bangsolochan') contains silica 90 p.c., or silicum as hydrate of silicic acid, peroxide of iron, potash, lime, aluminia, vegetable matter, "cholin, betain, nuclease, urease, proteolytic enzyme, diastatic and emulsifying enzyme, cyanogenetic glucoside.

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Action

Leaves are emmenagogue and anthelmintic. Tabashir (bamboo manna) is stimulant, astringent, febrifuge, tonic, cooling, antispasmodic and aphrodisiac.

Antitumor activity of bamboo leaf extracts against benzopyrene and 4-nitroquinoline-1-oxide-induced tumors in rats, after administration of extract (0.71 mg/ml) or its lignin 0.1% in drinking water libitum for 150 days, was found to be insignificant. Damage to tumor DNA by extract was observed *in vitro* indicating its direct action on tumor cells.

Bambusa arundinacea

Action and Uses in Ayurveda and Siddha

Mathura rasam, kashaya-anurasam, seetha-veeryam, brahmanam, balyam, vrishyam, in trishna, kasam, swasam, jwaram, raktapittam, etc. *Leaves*: Mathura kashayarasam, seeth-veeryam, kaphapittaharam, saram, chedanm, in Kushtam, raktavranam, soddhum or shodhanam. *Shoots*: Katu rasam, kashaya anurasam, katu vipaka, guru, ruksham, kaphaharam, vatapitta karam, guru vidhahi, saram. *Seeds*: Kashaya rasam, katu-vipakam, ushna veeryam, ruksham saram.

Action and Uses in Unani

Cold 2°, Dry 2°, tonic; tonic for heart and liver, sedative, of irritation of the body, in thirst, prevents safra, vomiting, palpitation, coma, safra fevers. *Bergai-Bhans*: Cold 3°, Dry 3°, diuretic, emmenagogue, balghami, cough.

Preparation

Decoction of leaves and of bamboo joints (1 in 20), *Dose*: 1 to 2 ounces. Compound powder, *Dose*: 1 drachm. Pickles and Poultice.

Uses

Young shoots of the Bamboo made into a *poultice* is a most efficacious application for dislodgement of worms from ulcers. *Juice* is poured on the vermin and the liquid mass applied and secured by a

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bandage. *Leaf-bud* is administered in decoction to encourage the free discharge of the menses or lochia after delivery when it is scanty. Used in leprosy, fevers, and haemoptysis, and also in cases of children suffering from thread-worms. *Leaves* are used hematemesis and veterinary practice. *Young leaves*, in the form of a decoction combined with some aromatic substance, have also been used as an emmenagogue. *Pickles* or curry prepared out of the tender shoots give much benefit to persons suffering from lack of digestion as it promotes appetite and digestion. The silicious concretion (bamboo manna) as found in the joints of the female bamboo, it is useful in fever, cough, consumption, paralytic complaints, debilitating diseases, asthma, snake-bite, etc. A *compound powder* containing long-pepper, cardamoms, cinnamon, sugar in ½, ¼, 1/8 and 2 parts respectively for 1 of *Tabashir* as an alterative in phthisis and cachexia; dose is 1 drachm. *Grain* is eaten by poor classes. *Root* is given as a specific in eruptive affections. *Older drier stems* make very efficient splints for fractures etc. *Seeds* resemble *rice* and are eaten by the poor. *Tender shoots* are also eaten like asparagus.

Barleria prionitis, Linn.

(Family: Acanthaceae)

Vernacular Names

Sans.–Vajradanti, Kurantaka, Koranta; *Hind.*–Catserina, Katsareya; *Ben.*–Kantajati; *Guj.*–Kantaasherio; *Mah.*–Pivala-koranta or koreta; *Gwalior*–Piyabans; *Tel. & Can.*– Mulugoranta; *Tam. & Mal.*–Shemmulli; *Kon.*–Gorti.

Varieties

White, red, yellow and blue coloured flowers.

Habitat

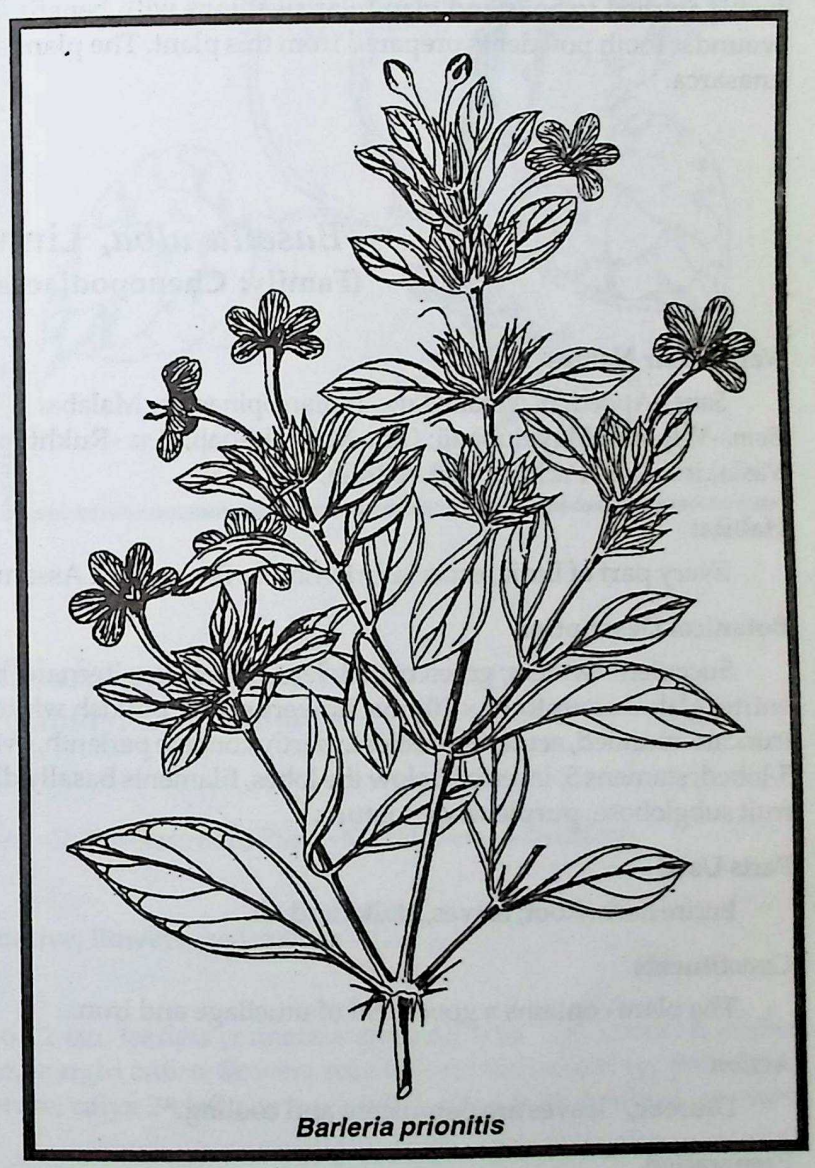
This small spiny bush is met with in tropical India, abundant in Bombay, Madras, South India, Ceylon, Assam and Sylhet.

Parts Used

Whole plant; especially leaves and root.

Constituents

Structure of a flavone glycoside, assigned earlier as scutel-



Barleria prionitis

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larein-7-O-rhamnoglucoside; has been modified as 5,6,4′-trihydroxy-7-O-neohesperidosyl-flavone (scutellarein-7-neohesperidoside) and confirmed by its synthesis.

Preparation

Paste, decoction of leaves and medicated oil.

Properties and Uses

Juice of the leaves administered in a little honey or sugar and water is a favourite medicine in catarrhal affections of children accompanied with fever and much phlegm; dose is two tablespoonfuls twice a day. Juice of leaves of the white variety mixed with *jeera* is given in spermatorrhoea; juice applied to feet in the rainy season prevents their cracking or laceration. Juice mixed with honey is applied to the bleeding teeth. It is also dropped, into the ear in otitis. *Leaves* of the yellow variety bruised or their juice with or without pellitory root is kept in the hollow of the aching tooth. *Paste of the root* is applied to boils and glandular swellings with benefit. *Medicated oil* is applied to unhealthy wounds. Tooth powder is prepared from this plant. The plant's parts are used in catarrh, cough and anasarca.

Basella alba, Linn.

(Family: Chenopodiaceae)

Vernacular Names

Sans.–Apoedika, Potaki; *Eng.*–Indian Spinach or Malabar Night-shade; *Hind.*–Poi; *Mah.*–Velbondi; *Bom.*–Velgond, Mayalubhaji; *Guj.*–Maya-ki-baji; *Ben.*–Rukhtopuri, Poi; *Tel.*–Bachali; *Tam.*–Pachalai, Vaslakire; *Mal.*–Pachala; *Can.*–Basale; *Kon.*–Vali.

Habitat

Every part of India, especially in Lower Bengal and Assam.

Botanical Description

Succulent twiners; green or red; leaves simple, alternate, broadly ovate, acute, cordate at base, entire, glabrous, upto 13 × 10 cms; flowers small, pinkish white in short axillary spikes; bract ovate, truncate-rounded, acute; bracteoles 2, partly connate perianth, ovate-concave, acute; perianth urceolate, 5-lobed; stamens 5, inserted below the lobes, filaments basally dilated, anthers oblong; ovary globose; fruit subglobose, purple when mature.

Parts Used

Entire herb. Root, leaves, stalks and all.

Constituents

The plant contains a good deal of mucilage and iron.

Action

Diuretic, "leaves are demulcent and cooling."

Preparation

Spinage, Poultice, Decoction and Mucilage.

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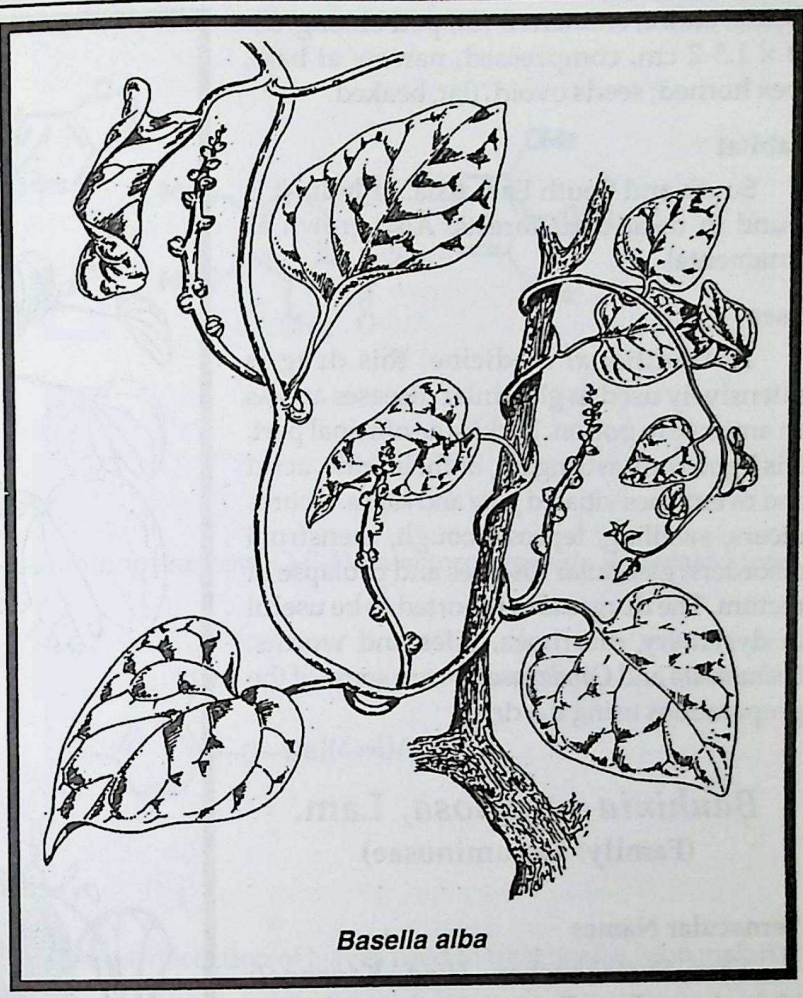
Uses

It is used as a substitute for spinach. It makes a wholesome and a most easily digested *spinage* and acts as a mild laxative. *Leaves* are reduced to pulp and applied to boils, ulcers and abscesses to hasten suppuration and are also used in urticaria. *Juice* of *leaves* together with sugar-candy is useful in the catarrhal affections of children, and administered with much benefit in gonorrhoea and balanitis. Leaf-juice thoroughly rubbed and mixed; with butter is a soothing and cooling application for burns and scalds. *Infusion* of the dried leaves of Basella lucida makes a nice drink, and *mucilaginous liquid* obtained from the leaves and tender stalks is a popular remedy for habitual headaches; it is applied to head about half an hour before bathing; it will produce a cooling sensation and bring on sound refreshing sleep. Basella cordifolia leaves are edible.



Basella alba

Bauhinia purpurea, Linn.
(Family: Leguminosae)

Vernacular Names

Sans.–Kanchan; *Hind.*–Koliar; *Ben.*–Rakta-kanchan; *Punj.*–Koiral; *Tam.*–Mandareh.

Action

Bark is astringent, root is carminative, flowers are laxative.

Botanical Description

Tree; leaves oblong, 5.5-11.5 × 6-12 cm, leaflets connate about half way, 11-13 nerved, plaited below, base subcordate, apex obtuse, margin entire; flowers rose in terminal or axillary panicles or racemes; buds narrow, obovoid, obtuse; calyx 2-cleft above; petals 5, rose or pink, equal, obovate-

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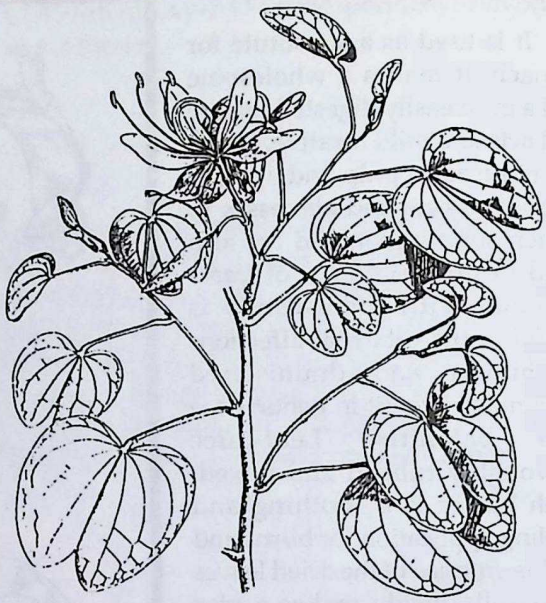
obtuse, entire; stamens 3 (5); pod oblong, 30-40 × 1.5-2 cm, compressed, narrow at base, apex horned; seeds ovoid, flat, beaked.

Habitat

South and South East Asia. In India it is found in deciduous forests. Also grown as ornamental.

Uses

In traditional medicine, this drug is extensively used in glandular diseases and as an antidote to poison. Bark is the officinal part. It is light, cool, astringent, anthelmintic, acrid and overcomes vitiated *pitta* and *kapha*. It cures ulcers, swelling, leprosy, cough, menstrual disorders, glandular diseases and prolapse of rectum. The drug is also reported to be useful in dysentery, diarrhoea, piles and worms. *Usirasavam* and *Candanasavam* are some of the preparations using the drug.



Bauhinia purpurea

Bauhinia racemosa, Lam.

(Family: Leguminosae)

Vernacular Names

Sans.–Svetakanchan; *Hind.*–Kanchnal; *Mah.*–Apta; *Ben.*–Banraj; *Punj.*–Kosundra; *Tam.*–Areka; *Can.*–Banne.

Habitat

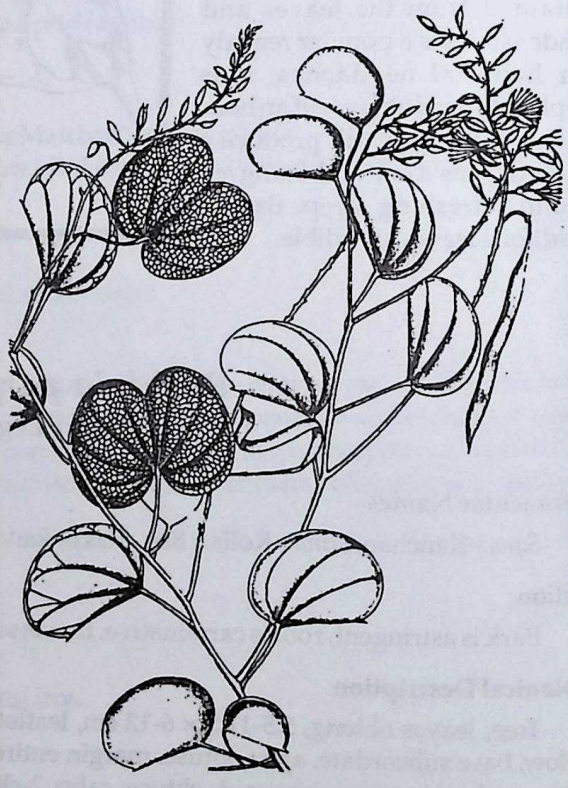
North Kanara of Bombay Presidency.

Parts Used

Leaves and gum.

Constituents

5,6,7,5′-Tetramethoxy-3′,4′-methylenedioxyflavone (I), 5,6,7,3′,4′,5′-hexamethoxyflavone (II) and 5,7,5′-trimetboxy-3′,4′-methylenedioxyflavone (III) isolated from roots along with 5,6,7,3′,4′-pentamethoxyflavone, 5,7,3′,4′,5′-pentamethoxyflavone and 5,7,3′,4′-tetramethoxyflavone.



Bauhinia racemosa

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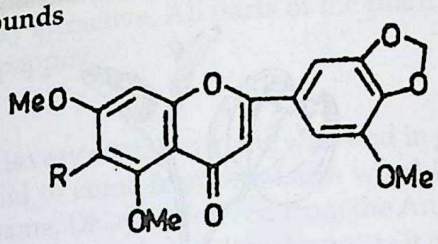
New Compounds

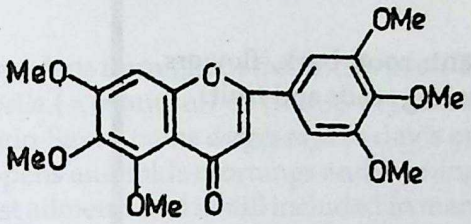


I

R = OMe

III

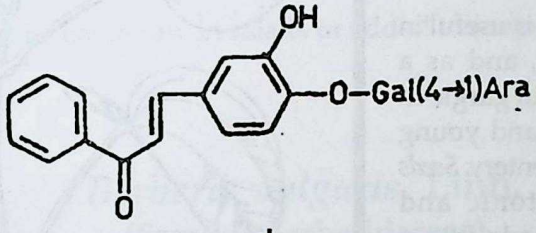
R = H



II

3,4- Dihydroxychalcone-4-O-β-L-arabinopyranosyl-O-β-D-galactopyranoside (I) isolated from seeds.

New Compounds



I

Leaves and barks are used in skin diseases; decoction of leaves used to treat headache in malarial fever.

Lauric, myristic, palmitic, stearic, oleic and linoleic acids identified in seed oil; lauric (0.1), myristic (0.1), palmitic (11.0), stearic (3.6), oleic (20.6) and linoleic (64.6%) acids determined in seeds by GC.

β-Sitosterol, lupeol and 5,7-dimethoxyflavanone–4′-O-α-L-rhamnopyranosyl-β-D-glucopyranoside isolated from stem.

Uses

Green leaves are liked by cattle. Gum is used medicinally. Leaves are used in headache and malaria.

Bauhinia tomentosa, Linn.

(Family: Caesalpiniaceae)

Vernacular Names

Sans.– Phalgu, Aswamantaka; *Hind. & Gwalior.*–Kachnar; *Ben.*–Kanchun; *Bom. & Guj.*–Asundro; *Mah.*–Pivala kunchan; *Tel.*–Adavimandaramu; *Tam.*–Kanchini, Tiruvatti; *Mal.*–Kattatti; *Can.*–Kadatti; *Kon.*–Chamel; *Madras.*–Esamaduga.

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Habitat

Throughout India and Ceylon.

Parts Used

Whole plant: root, bark, flowers, leaves, buds, young seeds and fruit.

Constituents

Tannin.

Action

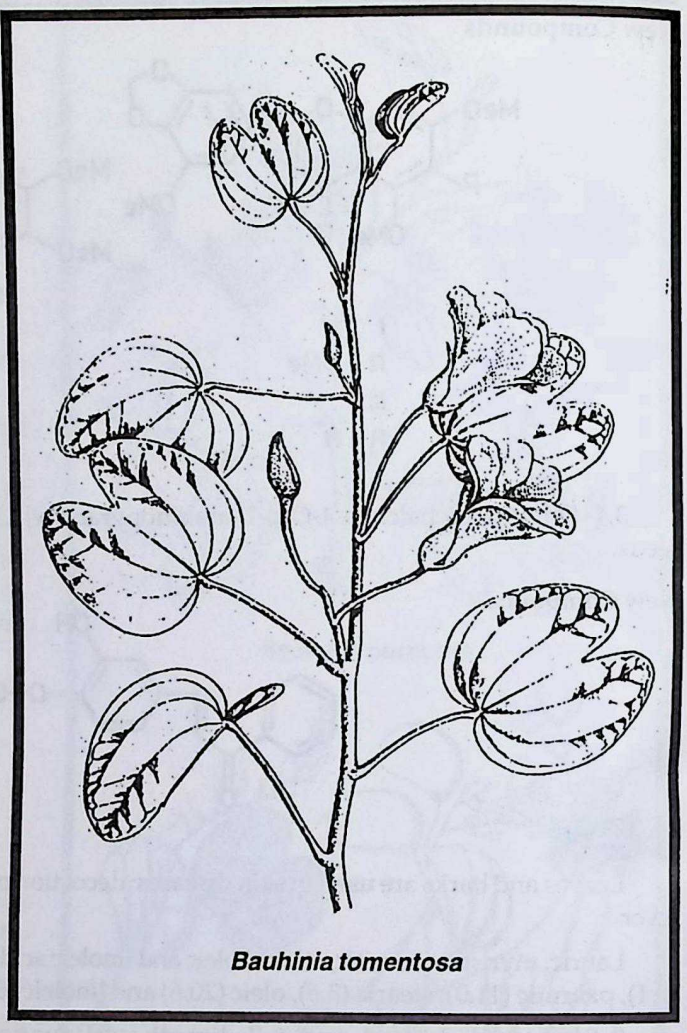
Plant is antidysenteric and anthelmintic. Fruit is diuretic. Seeds are tonic and aphrodisiac.

Preparation

Decoction, Infusion and Paste.

Uses

Decoction of the root-bark is useful in inflammation of the liver, and as a vermifuge. *Infusion* is a useful gargle in aplunae. *Dried leaves*, buds and young flowers are prescribed in dysentery. *Seeds* may be eaten for their tonic and aphirodisiac action, and made into a *paste* with vinegar as an efficacious application to wounds inflicted by poisonous animals, snakes and scorpions. *Bruised bark* ground with rice-water into a paste is *externally* applied to tumours and wounds sum as scrofulous.



Bauhinia tomentosa

Bellis perenis

(Family: Compositae)

Vernacular Name

Eng.–Daisy.

Botanical Description

A perennial herb of grassland and weed of lawns. The basal rosette of spathulate, bluntly serrate leaves stands up well to competition from other plants, including grasses, and from spring onwards Daisy successively produces several generations of flowers. The solitary flowerheads have white to

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pinkish, ligulate ray-florets and yellow, tubular disc-florets that close in the evening. Bees find the flowers very attractive. All parts of the plant are sparsely hairy. The fruit is an oval, downy achene without a pappus.

Habitat

Daisy is very common in the wild and in gardens throughout the British Isles. The generic name, *Bellis*, is said to come from the Latin word *bella* (= beautiful) or from a dryad called Belidis. The common name, Daisy, is derived from the Anglo-Saxon name *daeges eage* (= day's eye), a reference to the plant's resemblance to a 'small sun' as it opens and folds mornings and evenings. The plant was once a popular treatment for wounds and chest ailments and is still included in many modern herbal handbooks.

Uses

The flowerheads are used medicinally. The main constituents are saponins, an essential oil, tannins, mucilage, flavones and a bitter compound, all of which give Daisy astringent and expectorant properties. It has a beneficial effect on gastritis, enteritis and diarrhoea, and infections of the upper respiratory tract. In herbal medicine it is usually used as an infusion. Daisy also makes an attractive addition to tea mixtures. Externally it is used in compresses and bath preparations to treat skin disorders, wounds and bruises. A decoction from the fresh leaves is used for the same purposes.

Young fresh leaves can be eaten raw in salads or added to soups.

Berberis vulgaris, Linn.
(Family: Berberidaceae)

Vernacular Names

Eng.–True Barberrry; *Punj.*–Zirishk, Kashmal, Chachar; *Pers.*–Bedana; *Arab.*–Ambar-baris.

Botanical Description

A deciduous shrub with obovate, spiny serrate, short-stalked leaves borne in clusters on short, furrowed yellowish twigs in the axils of three spines. The small yellow flowers are arranged in drooping racemes. The stamens are sensitive–they spring inwards if touched near the base. The fruits are oblong, bright-red, sharply acid berries which ripen in the autumn. *All parts of the plant, except for the berries, are poisonous.*

Habitat

A member of the same species met with in Himalayas from Nepal and Tibet to Afghanistan with similar virtues and uses.

Barberry is found throughout Europe as far as the Caucasus in hedges and bushy places, especially where there is plenty of sun. In the British Isles it has a widespread but local distribution. It is introduced in Ireland and perhaps in many other British localities. As an ornamental shrub it is common in gardens. The common name Barberry is a corruption of the Latin world *berberis* for the plant, and in its turn *berberis* may be derived from the Arabic name for the fruit. Barberry's medicinal properties have

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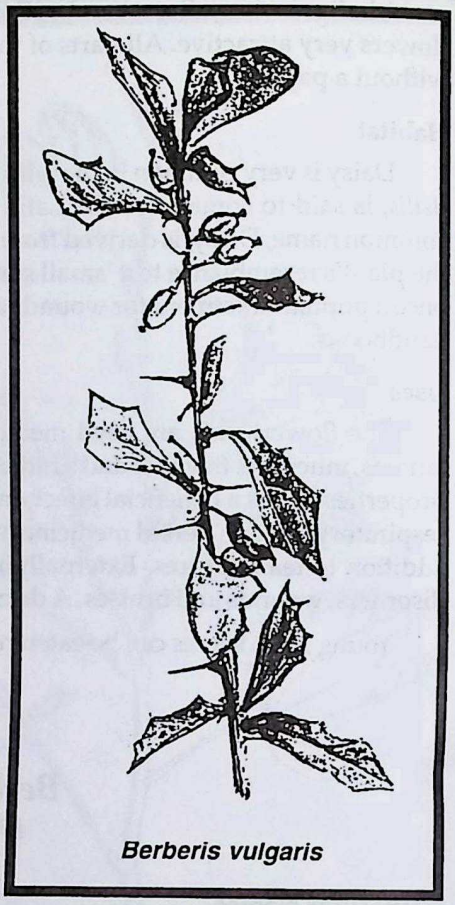
long been known. It was used to lower fever and to treat stomach, heart and liver complaints. The bark and stems yield a yellow dey.

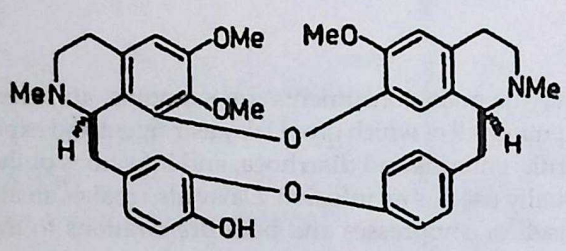


Berberis vulgaris

Constituents

Three new alkaloids–berbenin, mp. 152°, berbericine hydrochloride, mp. 199° and berbericinine hydroiodide, mp. 205°–isolated from roots.

New Compounds



Berbenine

Biological Activity

Berbenine showed depressant action on isolated rabbit heart. 5 mg/kg and 10 mg/kg, i.v. produced acute fall in blood pressure in dogs.

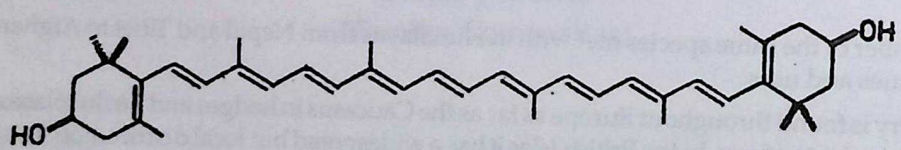
Oxyacanthine, mp. 212°, berbamine, mp. 124°, oxyberberine, mp. 200°, isotetrandrine, mp. 180°, jatrorrhizine, mp. 217°, magnoflorine iodide, mp. 228°, isolated.

Roots used in folk medicine for diuresis and relief of various ailments.

Berberine, berbericine and a new more polar alkaloid isolated as picrate, mp. 160°, from roots.

Carotenoids–α- and β-carotenes–lutein, zeaxanthin, chrysanthemaxanthin, flavoxanthin, auroxanthin and capsanthin identified in berries.

New Compounds



Zeaxanthin

A protoberberine alkaloid–karachine–isolated and characterised; taxilamine isolated; synthesis of karachine.

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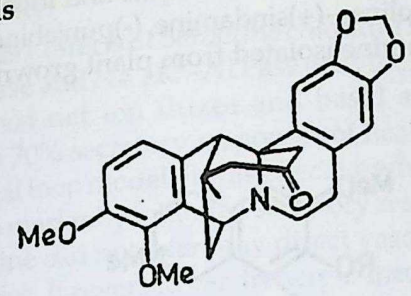
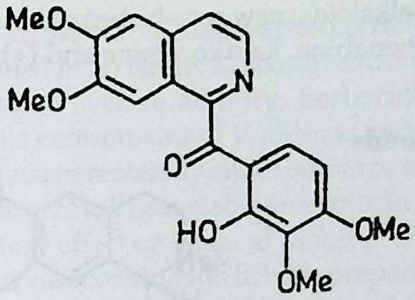
New Compounds



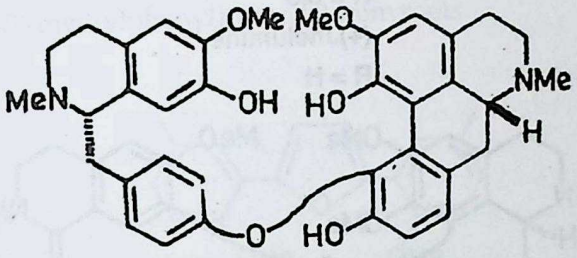
Karachine



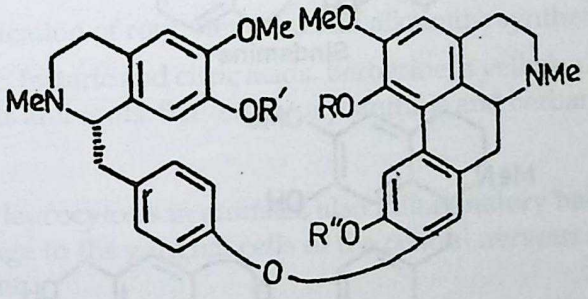
Taxilamine

New dimeric aporphine benzylisoquinoline–khyberine–isolated from roots and characterised; pakistanamine, 1-O-methylpakistanine, pakistanine, chitraline and kalashine also isolated.

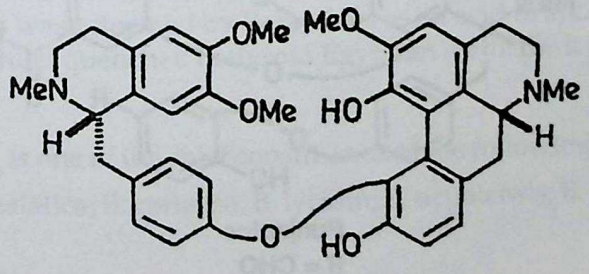
New Compounds



Khyberine



Chitraline
R,R',R" = H
1-O-Methylpakistanine
R,R' = Me,R" = H



Kalashine

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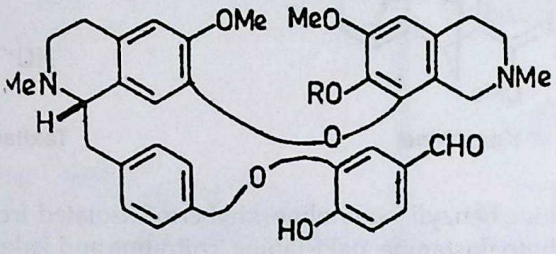
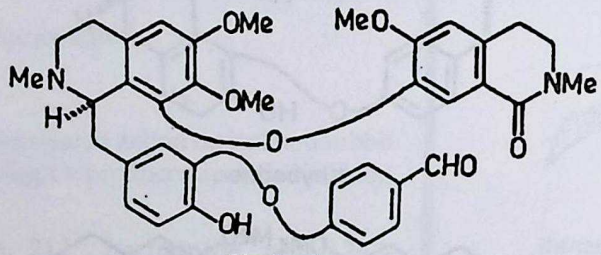
A process for preparation of berberine chloride from roots; analysis and identification of root, stem and leaf alkaloids; new seco-bisbenzyliso-quinolines–(+)sindamine, (-)punjabine and (-)gilgitine–isolated; (+)chenabine, karakoramine and (+)jhelumine isolated from plant grown in Pakistan and characterised.

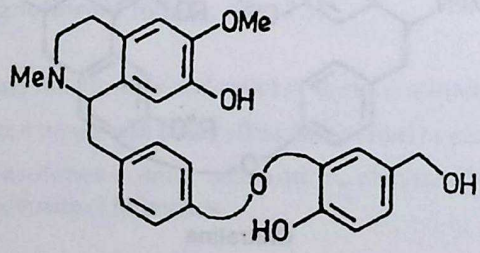
New Compounds



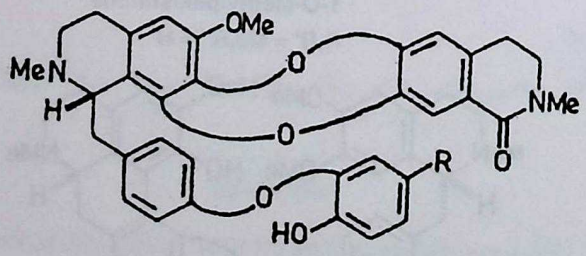
(+)Chenabine
R = Me
(+)Jhelumine
R = H



Sindamine



Karakoramine



Punjabine
R = CHO
Gilgitine
R = COOMe

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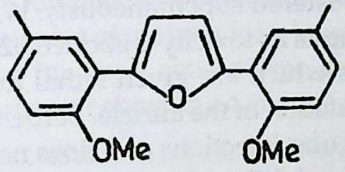
Biological Activity

Antisecretory effects of berberine chloride (1.0 mM) *in vitro* on intestinal ion secretion and mucosal adenylate cyclase and Na^+, K^+–ATPase activities studied in rat ileum. Mucosal berberine did not alter individual basal net ion fluxes and basal adenylate cyclase activity; berberine inhibited by approximately 70% secretory responses of heat-labile enterotoxins of *V. cholerae* and *E. coli* in rabbit ligated intestinal loop model. It was effective when given parenterally either before or after enterotoxin binding. It also markedly inhibited secretory response of *E. coli* heat-stable enterotoxin in infant mouse model; berberine did not exert any direct vasodilatory effect on isolated rabbit pulmonary and cat coronary arteries. It reversed α-adrenergic-mediated vasoconstriction in both preparations. In rabbit pulmonary arteries, berberine markedly antagonised both norepinephrine- and ergonovine-induced constriction while in cat it antagonised ergonovine-mediated constriction. It failed to block vasoconstriction of pulmonary smooth muscle by α-adrenergic-independent agents.

Kalashine, pakistanamine, pakistanine, 1-O-methylpakistanine, chitraline, berbamine, oxyacanthine and aromoline isolated from roots.

2,5-Bis(2′-methoxy-5′-methylphenyl)furan (I) from roots.

New Compounds



I

Analysis and identification of root, stem and leaf alkaloids; synthesis of zeaxanthin.

Berries contain malic, tartaric and citric acids. Berberine, a yellow alkaloid, is obtained from the bark parenchyma of stalks and roots. Berberine, oxycanthine and berbamine.

Action

Berberine produces leucocytosis in animals, also inflammatory haemorrhagic affections of the kidney and severe damage to the ganglial cells of the central nervous system, astringent, diuretic, antibilious and refrigerant.

Uses

Berberine is used in disorders of the bile and urinary passages, especially in biliary and renal calculi, congestions of the abdominal and pelvic cavitis, and rheumatism. It is specially valuable in scarlet fever and brain affections. Largely used in the Punjab as a diuretic for relief of heat, thirst and nausea. In small doses it is a tonic; in large doses it acts as a purgative. It was formerly used in jaundice. Juice of Barberis was esteemed by Paracelsus as an acid drink. Osiander also used it as an excellent and refreshing thirst quencher. In the old Egyptian medicine it played an important part.

Chemistry of Berberine

Berberine $C_{20}H_{19}NO_5$ is one of the chief constituents of the following plants:

Berberis aristata; B. asiatica; B. coriacea; B. lycium; B. nepalensis; B. vulgaris;

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Argemone mexicana; Coptis teeta; Toddalia aculeata; Coscinium fenestratum; Hydrastis canadensis.

Berberine is an intensely yellow and bitter alkaloid. It is widely distributed in the rot and bark and is the main source of the yellow colour of these plants. Berberine crystallises from water in long, silky, reddish-yellow needles with 5½ H_2O; from chloroform, it forms triclinic tablets containing 1 $CHCl_3$; the acetone compound, B. C_3H_{60}, forms reddish-yellow tablets. Berberine melts at 144°C and when acidulated with sulphuric acid in a test tube and brought in contact with chlorine water it gives a blood-red ring at the junction. It precipitates with nearly all the alkaloid precipitants.

Berberine base dissolves in 4.5 parts of water at 21°C. A number of salts, such as the carbonate, sulphate, hydrochloride, etc., have been prepared. They all have a yellow colour and are very sparingly soluble in water, except the acetate and the phosphate which have a solubility of 1 in 15 parts of water. The solubility of the sulphate is 1 in 150, but the acid sulphate is more soluble; the hydrochloride is soluble 1 in 400 parts of water. The solubility in water increases on warming the solution or on the addition of alcohol and benzol.

Pharmacological Action of Berberine

Berberine is not a very toxic alkaloid, its minimum lethal dose for rabbids being about 0.1 gm. per kilogram of body weight when administered subcutaneously. When administered intravenously to cats and dogs under lurethane anaesthesia its toxicity is about 0.025 gm. per kilogram of body weight. Post-mortem examination of animals which are given lethal doses of the drug shows a marked congestion of the lungs and a wide dilatation of the auricle. Berberine is absorbed fairly rapidly when given by subcutaneous and intramuscular injections and does not set up any marked local reaction even when a 10 per cent solution is injected. When the alkaloid is given by the mouth it can be detected in the urine within a few hours showing that it is absorbed from the gastro-intestinal tract, and is excreted through the kidneys. A portion of it is, however, oxidised in the body.

Berberine has a stimulant action on the movements of the gastro-intestinal tract. The contractions of the stomach in an unanaesthetised cat are increased by subcutaneous injections of berberine. Intravenous injections of small doses of the alkaloid in anaesthetised animals, e.g., the cat and the dog, show stimulant action the movements of the small intestines. Perfusion experiments with pieces of different portions of the gut also show an increase in the tone of the muscle with such concentrations as 1 in 50,000 and less.

The cardio-vascular system is depressed by Intravenous administration of berberine salts. There is a sharp fall of blood pressure, the degree of fall and its duration depending upon the dose administered. This is due to dilatation of the blood vessels of the splanchnic area in particular. The force and amplitude of the isolated mammalian heart is decreased by such dilutions as 1 in 50,000. In myocardiographic experiments both the auricles and the ventricles are depressed and the heart shows a distinct dilatation.

The respiratory system is markedly affected by the drug. Intravenous injections show an initial stimulation which might be due to the lowering of blood pressure or due to emboli formed in the capillaries of the lungs. The initial stimulation, however, soon gives way to depression especially when larger doses are given. The respiratory centre is depressed and death is generally due to failure of the respiration; the heart goes on beating long after the respiration stops.

Gupta have shown that berberine is toxic to Leishmania tropica in concentrations as high as 1 in 80,000. While powerful protoplasmic poisons like quinine or emetine require about 80 times this

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concentration to produce the same effect. This specific toxic action of berberine has led to its use in 'oriental sore', due to an infection by Leishmania tropica.

Therapeutic Uses

Berberine-containing plants have been used by both the Hindu and Mohammedan physicians as a stomachic, bitter and tonic in the same way as quassia and calumba. They have been used as an antiperiodic and alterative in remittent types of fevers. They have also been used in the treatment of leprosy, snake-bite, jaundice and vomiting of pregnancy. The fruits or berries of B. asiatica are given as a mild laxative to children. The stems are said to be diaphoretic and laxative and are recommended in rheumatism. The root bark is rich in bitter principles and is used as a tonic and antiperiodic. Instead of the root-bark, the root itself is employed as an antiperiodic, diaphoretic and antipyretic and its action was believed to be as powerful as quinine. A decoction made from the root was said to bring down fever. The dried extract of the root known as *rasaut* or *ras* is used as a purgative for children, as a blood-purifier and as an external application in conjunctivitis in combination with opium. As a local application it is used for indolent ulcers. It has also been recommended for gastric and duodenal ulcers.

Malaria

Berberine and its compounds are reputed to have effective antiperiodic properties and have been used by Indian physicians in the treatment of malaria for a long time. The drug was administered in 3 to 5 grain doses three times a day for three consecutive days, but there was no change in the paroxysms and microscopical examination showed no change in the number of malarial parasites.

In a series of 9 cases which were tested, in no instance was there any change in the signs and symptoms of the patients. An infections whether those with P. malariae, P. vivax or P. falciparum remained unaffected by the alkaloid. Quinine administration in these patients had the desired therapeutic effect. It will be seen, therefore, that the belief that berberine is useful in malaria is not founded on facts.

There is still another use of berberine in malaria not as a curative agent, but as a diagnostic measure. It is said to liberate the parasites into the circulation so that, whereas blood films taken before the administration of berberine are negative, those taken after it are positive. Sabastine used berberine as a provocative agent for the diagnosis of latent malaria. Percy Andre advocated the hydrochloride in cases of malarial splenomegaly. Chopra showed that injections of pentavalent compounds of antimony produce an increase in the volume of the spleen and the liver. Besides this, the rhythimic contractions of these organs are stimulated. The spleen is known to act as a filter to remove microorganisms such as bacteria and protozoa from the blood stream and malarial parasites occur in large quantities in this organ. Berberine has been shown to increase the volume of the spleen and to increase its rhythmic contractions. It will, therefore, expel malarial parasities into circulation in the same way as shown that injections of antimony compounds expel the leishmania.

Oriental Sore

The most important use of berberine is however, in the treatment of oriental sore. Jolly in 1911 first tried 'rasaut', which contains large quantities of the crude alkaloid, in the treatment of this condition with varying results. Varma was the first to use berberine sulphate successfully in the treatment of oriental sore. Karamchandani in the same year tried different methods of treating the sore and reported that injections of berberine sulphate were most successful. Some tried berberine in patients suffering from sores as well as in experimentally-produced lesions in mice and concluded that the drug, had a

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specific effect in curing these conditions. There is, therefore, no doubt about the effectiveness of this alkaloid in this form of cutaneous leishmaniasis. The following technique has been recommended:

1 to 2 c.c. of a 1 per cent solution of the sulphate is infiltrated into the margins of the sore by means of a fine hypodermic syringe. Four or more punctures are made and care is taken to see that the infiltration is evenly spread. Injections are given once a week, and the sore is dressed with ordinary surgical dressings. As a rule not more than three injections are required to bring about complete cure, but a large number of injections may have to be given until the desired results are obtained. It must be remembered, however, that if there are multiple sores on the body, it is not advisable to infiltrate more than two sores a day and not more than four sores a week, especially if the sores are of a large size.

The solutions of berberine sulphate are stable and can be preserved in sterile tubes with rubber caps, so that the requisite amount can be withdrawn with a syringe whenever required for administration. Messrs. May & Baker have put on the market readymade solutions of berberine under the trade name 'orisol'.

Betula pendula
(Family: Betulaceae)

Vernacular Name

Eng.–Silver Birch.

Botanical Description

A tall, deciduous tree with pendulous brown branches and a trunk with smooth silver-white bark above and blackish fissured bark towards the base. The branches have small, resinous wart-like structure (lenticels) on their surface. The leaves are alternate, long-stalked, pointed oval and doubly serrate and sticky at first. Silver Birch is monoecious: the purple-brown male flowers are arranged in drooping catkins; the green female catkins are small and erect but hang when mature. The fruit is a winged achene.

Habitat

Silver Birch is common and widespread in Europe and Asia where it grows in woods, scrub and heaths, preferring sandy or gravelly soils. It is found throughout the British Isles. In northern countries Silver Birch was held to have sacred powers against evil spirits and witchcraft and there are many place names embodying the name of the Birch or its Scottish or northern English equivalent 'birk'. The Anglo-Saxon name for the tree was *beore* or *birce*, and it was probably derived from a word for 'white' or 'shining'. Birch leaves have long been used to treat disorders or the urinary system and rheumatism.

Constituents

Betulin, lupeol, oleanolic acid, acetyl oleanolic acid and leucocyanidin from bark.

Uses

The young leaves are used medicinally. When dried they are aromatic and have a bitter taste. Among the constituents are saponins, tannins, trace of an essential oil, resin and bitter compounds. These substances give Silver Birch milk diuretic and disinfectant properties, but they do not irritate the

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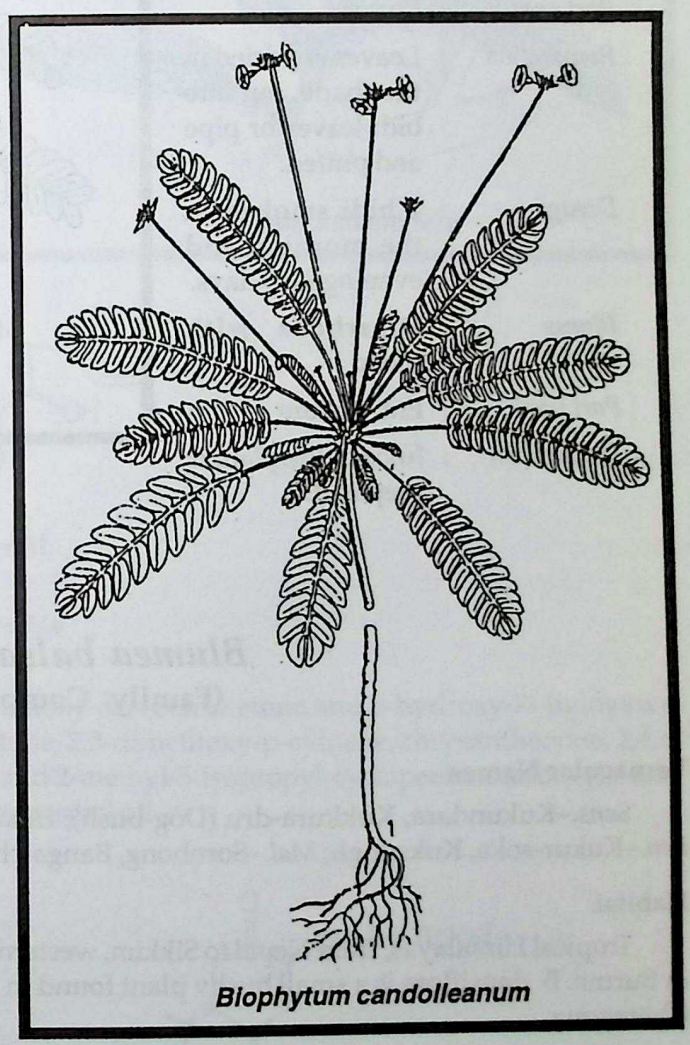
kidneys. For this reason Silver Birch leaves are a basic ingredient of herbal tea mixtures used for urinary infections and for kidney stones. The herb is also diaphoretic, particularly in combination with flowers of lime (*Tilia*) and it eases rheumatic pain. Externally the leaves make invigorating bath preparations. Dry distillation of fresh birch wood yields birch tar, which is used in smoothing ointments for skin ailments.

Biophytum candolleanum
(Family: Oxalidaceae)

Botanical Description

Erect herb; stem simple, hispid; leaves crowded into a rosette at the tip of the stem, 8 to 12 cm long, paripinnate; leaflets 8-15 pairs, sensitive to touch, subsessile, glabrous above, pale beneath, smaller ones towards the base; flower small, yellow on long-peduncled umbels; sepals 5, lanceolate, glandular-pubescent, 5-nerved; petals 5, laterally cohering to form a salver-shaped corolla; stamens 10, free, dimorphic; ovary 5-chambered with many ovules on axile placenta, styles 5, ending in notched or bifid stigmas; fruit a small ellipsoid, loculicidal capsule.



Biophytum candolleanum

Habitat

Widespread in tropical Indo-Malaysia. The plant is found throughout the hotter parts of India, ascending to 1800 m. It is very common in shady moist places, roadsides, river banks and also on cultivated ground.

Uses

This is one of the ten auspicious herbs that constitute that group *Dasapuspas*. The whole plant is reportedly cooling, bitter, astringent, antipyretic, antiseptic and alleviative of *pitta* and *kapha*. It is useful in fever, burning sensation, haemorrhages, chronic cough, dysentery, urinary calculi and vaginal disorders. It cures piles and hydrocele. The leaves are antiseptic and styptic and hence very useful in healing wounds and ulcers. The leaves acts as diuretic when given internally. *Cemparutyadi tailam* is an important preparation using the drug.

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Biophytum sensitivum

Vernacular Names

M.–Laajri; *Hind.*–Lajalu.

Illness : **Bleeding from the nose**

Part used : Entire plant

Preparation : Juice of the plant is prepared.

Dosage : 2 teaspoonful juice are taken in the morning and evening until cured.

Illness : **Sores on tongue**

Part used : Leaves

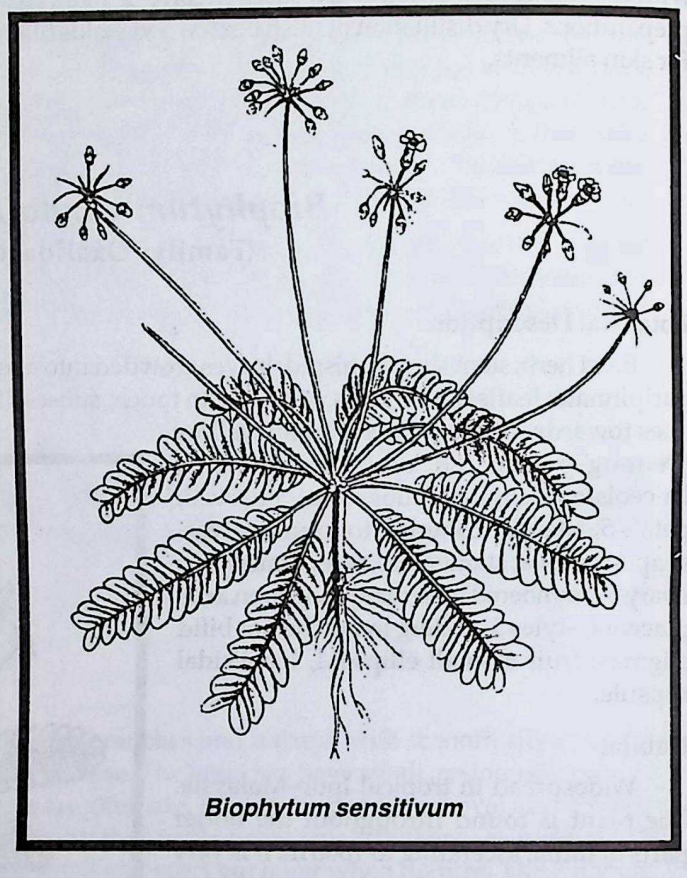
Preparation : Leaves are dried in the shade, put into bidi leaves or pipe and puffed.

Dosage : 1 bidi smoked in the morning and evening for 3 days.

Illness : **Diarrhoea with blood**

Part used : Entire plant

Preparation : Juice of the plant is prepared.



Biophytum sensitivum

Blumea balsamifera

(Family: Compositae)

Vernacular Names

Sans.–Kukundara, Kukkura-dru (Dog-bush); *Hind.*–Kukronda, Kakoranda; *Bom.*–Bhamaruda; *Ben.*–Kukur-soka, Kuksungh; *Mal.*–Sornbong, Banga-chappa; *Burm.*–Pung-ma-theing; *China*–Nagi.

Habitat

Tropical Himalayas, from Nepal to Sikkim, western part of Deccan plateau, and very abundantly in Burma. B. densiflora is a small bushy plant found in various parts of Assam, the Khasia Hills and Chittagong.

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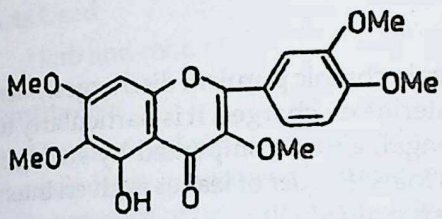
Parts Used

Leaves and sometimes the herb.

Constituents

Structure of erianthin revised to 5-hydroxy-3,3′,4′,6,7-pentamethoxy-flavone.

New Compounds

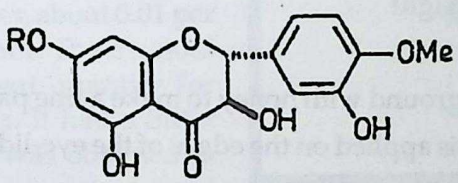


Erianthin

Two new flavonoids–2R,3R-dihydroquercetin-4′-methyl ether (I) and 2R,3R-dihydroquercetin-4′,7-dimethyl ether (II)–isolated from leaves.

Blumea balsamifera

New Compounds



I

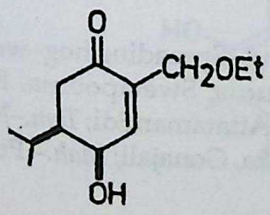
R = H

II

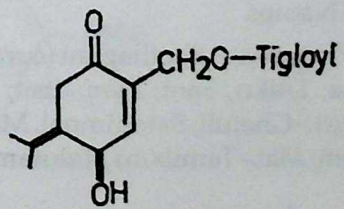
R = Me

Isolation and structures of 5-hydroxy-7-ethoxy-carvotanacetone and 5-hydroxy-7- tigloyloxy-carvotanacetone; n-triacontane, n-hentriacontane, 2,3-dimethoxy-p-cymene, chrysanthenone, 2,4,6-trimethoxyallylbenzene, caryophyllene oxide and 2-methyl-5-isopropyl-cyclopentenecarboxylic acid detected in oil; chrysanthenone isolated from essential oil.

New Compounds



5-Hydroxy-7-ethoxycarvotanacetone



5-Hydroxy-7-tigloyloxycarvotanacetone

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Preparation

Both the species contain a volatile oil of the odour of worm-wood, and a camphor known as *Nagi* camphor; it has the same physical properties as Borneo Camphor, but differs in optical properties.

Action

Astringent and anthelmintic, "sudorific, carminative and expectorant."

Preparation

Decoction of dried herb; powder of leaves.

Uses

Externally, fresh juice of the leaves is dropped into the eyes in chronic purulent discharges. *Internally* the *decoction* is given for worms, in dysentery and chronic uterine discharges. It is particularly useful in the disease of the nose called "Ahwah" peculiar to Bengal, and accompanied by strong fever, heaviness in the head, and pains in the neck, shoulders and loins. *Powder* of leaves is given internally in two drachm doses mixed with butter, and is also used as a snuff.

Boerhaavia chinensis, Aschers & Schweinf

Vernacular Names

Eng.–Spreading hogweed; *Mar.*–Punarnava, Ghetulli; *Hind.*–Sant.

Illness	:	**Weak eye sight**
Part used	:	Roots
Preparation	:	Roots are ground with honey to make a fine paste.
Dosage	:	The paste is applied on the edges of the eye-lids at bedtimes for 7 to 21 days.
Illness	:	**Diminished breast milk**
Part used	:	Roots
Preparation	:	One handful of roots are crushed fine and kept in 1 cup of water for half-an-hour, strained and taken.

Boerhaavia diffusa, Linn.

(Family: Nyctagineae)

Vernacular Names

Sans.–Punarnava, Shothaghni (cure for dropsy). *Eng.*–Spreading hog–weed; *Hind.*–Beshakapore, Gadhaparna, Thikri, Sant; *Punj.*–Itsit; *Ben.*–Gandhapurna, Swetapoorna, Punarnaba; *Guj.*–Vakha-Khaparo; *Bom.*–Ghetuli, Satodimool, Motosalado; *Tel.*– Attatamamidi; *Tam.*–Mukkartai, Mukukrattai, Kadiyirattam; *Mal.*–Tamilama, Talutama; *Can.*–Sanadika, Gonajali; *Mah.*– Punarnava, Khapra, Vasu.

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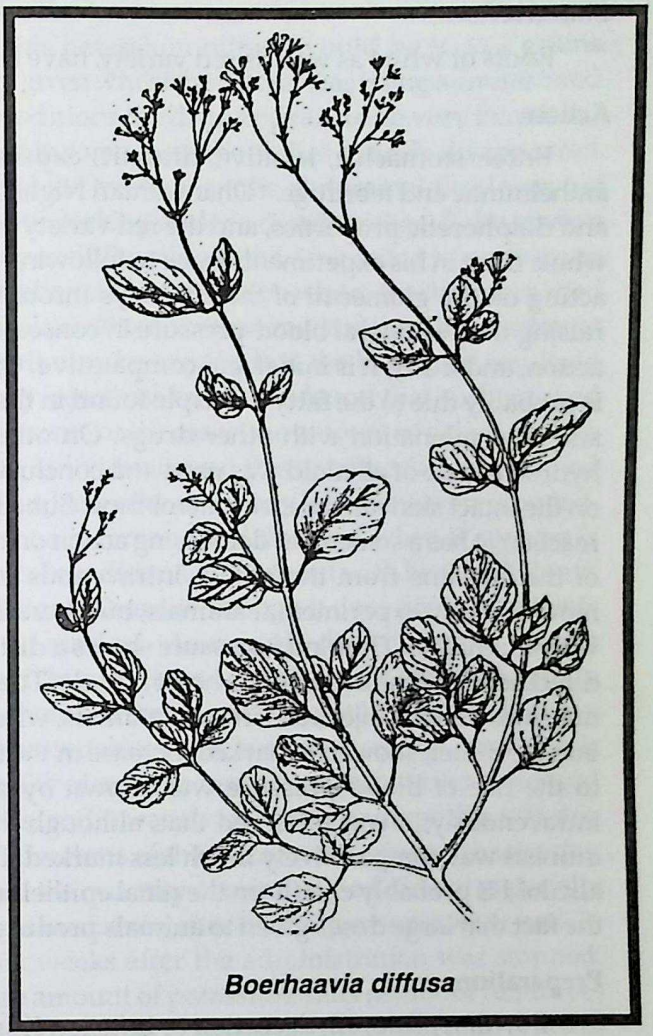


Boerhaavia diffusa

Habitat

Found all over India, especially abundant during the rains; it is of two kinds, one with white flowers called "shweth-purna" and the other with flowers called "rakta-purna" the former is used in medicine. In the Tibbi literature a third variety with blue flowers has also been described.

Parts Used

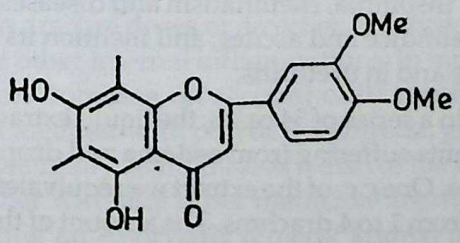
Herb and root.

Constituents

The air-dried plant was found to contain unusually large quantities of potassium nitrate. As the presence of this salt may partly account for the diuretic action of the drug, the total content of potassium present in the plant was estimated. Taking the whole of potassium as potassium nitrate, its quantity in the powdered drug amounted to about 6.41 per cent. This is however, unlikely and it is probable that other salts of potassium are present. Besides these salts, there is an active principle–an alkaloid, present in very small quantities, about 0.01 per cent of the weight of dry plant. The alkaloid was isolated in just sufficient quantity for pharmacological experiments. It had a bitter taste and the hydrochloride was obtained in crystalline form. It has been named 'punarnavine'. It contains a sulphate of body alkaloidal in nature (*punarnavine*) 0.01 p.c., potassium nitrate 6.41 per cent; an oily amorphous mass of the nature of a fat; sulphates and chlorides and traces of nitrates and chlorates from the ash. "The sulphate of the alkaloid is described as small needle-shaped crystals brownish-white in appearance when in mass. Its taste is nearly bland or very faintly bitter and resembles that of impure quinine sulphate. The yield of the alkaloid as sulphate was 300 mgm. from 20 ozs. of the original plant, *i.e.*, 0.053 p.c.

β-Ecdysone (0.05%), triacontanol and β-sitosterol isolated from roots; 5,7-dihydroxy-3,4'-dimethoxy-6,8-dimethylflavone (I) isolated from roots.

New Compounds



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Characteristics

Roots of white as well as red variety, have a bitter and nauseous taste.

Action

Bitter, stomachic, laxative, diuretic, expectorant, diaphoretic and emetic. Root is purgative, anthelmintic and febrifuge. "Dhanwantari Nighantu described the white variety as possessing laxative and diaphoretic properties, and the red variety is bitter Ghoshal, who used an aqueous extract of the whole drug in his experiments came to following conclusions: The active principle is a diuretic chiefly acting on the glomeruli of the kindneys through the heart, increasing the beats and strength, and raising the peripheral blood-pressure in consequence. On the cells of the tubules it exerts little or no action, and if any, it is initial and comparative. On the respiration it has little or no action; any action is probably due to the fatty principle found in the weed. On liver, the action is principally secondary, and in combination with other drugs. On other organs the drug has practically no effects. The hydrochloride of alkaloid was used and conclusions were as follows: It has little or no irritant action on the intact skin and mucous membrane. Subcutaneous injection does not set up any marked local reaction; it has a somewhat depressing action on the tone and peristaltic movements of isolated pieces of the intestine from the rabbit. Intravenous injection of the alkaloid stimulates the respiratory movements in experimental animals, but there is no relaxation of bronchial muscles such as occurs with adrenaline. The blood pressure shows a distinct and persistent rise which is probably due to the direct action of the drug on the heart muscle: The diuretic effects were investigated in the cat and the dog; intravenous injections in such animals, where the flow of urine is being recorded by a cannula into the ureter, showed a marked increase in the flow of urine. That the diuresis was not entirely due to the rise of blood pressure was shown by giving 1/20 c.c. of 1 m 1000 adrenaline solution intravenously; it was observed that, although there was a much bigger rise of blood pressure, the diuresis was comparatively much less marked. It may be concluded, therefore, that the effect of the alkaloid is probably chiefly on the renal epithelium. That the alkaloid is not very toxic was shown by the fact that large doses given to animals produced no untoward effects.

Preparation

Powder, paste, oil, decoction or infusion (1 in 20) and electuary.

Uses

The white variety is efficient in oedema, anaemia, heart disease, cough and intestinal colic. The red variety is beneficial in oedema, haemorrhage, anaemia and biliousness. In 'Rajnighantu' the white variety is recommended in diseases of the nervous system, and in 'Bhavaprakash' in heart disease and piles. Charaka used it in the form of an ointment in leprosy and skin diseases, and as a decoction in stone in the kidney and in oedema. Local applications of the root-paste have been recommended in oedematous swellings. Sushrata mentions its use in snake-poisoning and rat-bite infection. Chakradatta used it in the treatment of chronic alcoholism and various other writers recommended it in phthisis, insomnia, rheumatism and diseases of the eye. The Tibbi physicians lay stress on its use in asthma, jaundice and ascites, and mention its diuretic properties. They also use it as a vermifuge and febrifuge and in urethritis.

Workers carefully tried in a series of 34 cases, the liquid extracts made both from the dry and fresh plant (white variety) in patients suffering from oedema and dropsy due to various causes, and found them to be equally efficacious. One c.c. of the extract was equivalent to 1 gm. of the dried plant and this was given in doses ranging from 1 to 4 drachms. The amount of the alkaloid in such doses worked out

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to be 0.35 to 1.40 mgm. or roughly 1/40 to 1/160 grain. The total amount of potassium base (not salts) in similar doses would be 1.5 to 6.0 grains and of this potassium nitrate would be ½ to 2 grains. Excepting an occasional purgative no other drugs were given whilst the extract was being administered. In cases of ascites due to early liver and peritoneal conditions the drug appears to be very beneficial. It produced a very marked and persistent diuresis and in some cases the ascites entirely disappeared. The diuretic effect, though not so marked, was produced even when the abdominal fluid was not removed by preliminary tapping and the kidneys were working under a disadvantage. If the tension inside the abdomen was high and the urine was scanty and albuminous the drug failed to produce an effect unless the ascites was previously relieved. A number of the patients on whom the drug was tried were either complicated with Kala-azar or the dropsical condition was not marked until the treatment with antimony injections was given simultaneously. It may be argued that the beneficial results in these cases were entirely due to the effect of antimony injections but it was found that such marked diuresis is, as a rule, not caused by antimony alone. In some of the cases, the amount of urine was two to three times the normal quantity secreted in healthy individuals, and this increase was maintained even when the ascites and oedema had disappeared and after the antimony injections were stopped. As a matter of fact, ascites in cases of Kala-azar is not a common condition and when it appears is usually terminal. The drug acts best when the dropsical condition is associated with healthy kidneys as in Kala-azar or ascites caused by dysenteric conditions. Diuresis, though it does occur in patients with copious albumin in their urine, is often not so marked. As regards dropsy due to cardiac conditions, its effect does not appear to be very marked. In such cases, digitalis or the ephedrine group of drugs are much more efficacious. In ascites with advanced structural changes in the liver, kidneys and peritoneum, only temporary benefit can be expected, but even in such cases the condition is greatly improved. In a certain number of cases the quantity of urine decreased somewhat after prolonged administration of the drug for a period of 4 to 6 weeks, and it was thought that perhaps this was due to the toxic effect of the drug. To test this point, 2 to 3 drachms of the extract were given 3 times a day for over 2 months to several cases. It was observed that the quantity of urine passed did not materially alter and in some cases the diuretic effects were maintained, even after the drug was discontinued. In one case, the diuresis was maintained for nearly six weeks after the administration was stopped. When the liquid extract is used the presence of a large amount of potassium salts no doubt reinforces the action of the alkaloid. The drug appears to exert a much more powerful effect on certain types of ascites, *i.e.*, those due to early cirrhosis of the liver and chronic peritonitis (Hale White) than some of the other diuretics known. The drug is an antidote to snake-venom.

The drug is given in conditions where there is lessened secretion or where increased secretion of kidney is wanted; thus in all renal affections stopping secretion of kidney, in ascites either from cirrhosis of liver or heart or kidney. As it increases the systole of the heart it is useful in all stenosed conditions of the valves. Where there is dropsy and ascites due to weakness of heart this drug does much good by relieving the circulation through the kidney. In pleurisy and some such conditions of accumulation of fluid in the cavities, the drug is useful as it increases the quantity of urine. *Juice of the leaves* is used in hepatic disorders of jaundice; with honey it is dropped into the eyes in chronic ophthalmia. *Root* is used in *powder* in drachm doses or *decoction* or *infusion* as *laxative*. As diuretic it is useful in strangury, gonorrhoea and other internal inflammations; in moderate doses it is successful in asthma; in large doses it produces vomiting on account of its emetic properties. In dropsy the *decoction* of the root is administered together with powdered chiretta, ginger and about 15 grains of nitrate of potash; it is also applied externally. In mild cases a dish of the fresh herb boiled, salted and eaten with bread (*chappaties*) together with any other medicinal treatment does give much relief. Following is the method of preparing an Ayurvedic remedy known as "*Punarnavaslaka*": Take of

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punarnava root, nim-bark, leaves of Trichosanthus dioica, ginger, Picrorrhiza kurroa, chebulic myrobalan, *gulancha* and the wood of Berberis asiatica, quarter of a tola each, water 32 tolas; boil together till reduced to one-fourth. This decoction is given in general anasarca with ascites, cough, jaundice, difficulty of breathing etc. An *oil* called "*Punarnava Taila*" prepared from the root and a number of useful aromatics in the form of a paste is rubbed on the body in general anasarca complicated with jaundice, (Sarakaumudee). Bhavaprakash gives an electuary under the name of *Punarnava leba*. It is prepared with a decoction of the root and a number of other ingredients and is used in strangury or scanty urine. A *paste* made of the root together with Colchicum, Solanum nirgum, Tamarind stone, stag's horn, and dried ginger, all equal parts, is an application to rheumatic and gouty painful joints. Root of the *B. repeus* is an ingredient in the preparation of *surma*, an application to eyelids.

Bombax malabaricum

(Family: Malvaceae)

Vernacular Names

Sans.–Rakta shalmali, Mahavriksha, Panchparni; *Eng.*–Silk Cotton Tree; *Hind.*–Nurma, Deokapas, Huttian, Shimal; *Ben.*–Ruktasimal, Shimul; *Tel.*–Mundlaboorugachettu, Poor kondab.

Bombax malabaricum

Parts Used

Almost all the parts of the tree are used for different medicinal purposes: Gum, seed, leaves, fruit or its capsule, tap root, bark, cotton and flowers.

Historical Aspects

Different parts of the plant, particularly the gum–Mochras–has been utilized for medicinal purpose in Ayurveda for many centuries. The soft cotton is used for filling pillows and mattresses.

Habitat

It is found throughout the warmer parts of India and Sri Lanka. Mainly in the forest regions, but also cultivated in gardens and lining avenues, for its beautiful flowers.

Botanical Description

It is a large tree. *Leaves* are large–petiole is longer than the leaflets, secondary petiole is 2.5 cm long, leaflets are lanceolate, entire. *Flowers* are large, red in colour. Occasionally white,

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appearing before the leaves. *Fruit*–capsule is 15-17 cm long, ovoid, downy, it is 5 valved and from within it is silky.

Pharmacognosy

The structure of this plant is that of a typical dicotyledoonous type in both root and stem, but is characterized by the occurrence of concentric series of fibre patches alternating with the groups of sieve elements in the secondary phloem. The presence of mucilage, tannin cells and cells containing rosette crystals of calcium oxalate in the ground tissue of the root and stem are other features distinguishing the plant.

Phytochemistry

Preliminary tests showed the presence of glycosides and tannins in root, stem and leaf. The stem in addition showed some alkaloids while the root revealed the presence of proteins. The isolation of lupeol and β-sitosterol from the petroleum ether extract of the stem bark has been reported. From the root bark three naphthalene derivatives have been isolated. 6-methyl ether of semi-gossypol and 1,4-quinone of semigossypol and its quinone have been isolated. The flowers have β-D-glucoside of β-sitosterol, free β-sitosterol hentriacontane, hentriacontanol, traces of essential oil, kaempferol and quercetin. Seeds yield a non-drying oil. Gum is called Mochras or supari-ka-phul and contains tannic and gallic acids.

Ayurvedic Properties

Guna: Laghu, Snigdha, Pichchila. *Rasa*: Madhura, *Veerya*: Sheeta. *Vipaka*: Madhura. *Dosha*: Pittavatahara. *Karma*: Rasayana, Grahi, Raktapittajit, Kasahara.

Pharmacology

The aqueous extract of the seeds of *B. malabaricum* had moderate oxytocic activity on rat uteri and on guinea pig and rabbit uterine strips. It was mainly indirectly and partly directly stimulant to guinea pig ileum and myocardiac stimulant to frog's heart *in situ*. It had a negligible blood-pressure elevating action in anaesthetized dogs.

Safety

With the standard doses, the plant is well tolerated, LD_{50} of aqueous extract in rats was 36.3 g/kg. given i.p.

Clinical Usage

This drug is a Rasayana. It is a component of Dashamulkwatha. Generally the gum is used in vata diseases. It is used in diarrhoea, dysentery menorrhagia and leucorrhoea. The gum contains a large proportion of tannic and gallic acids and may be successfully used in cases requiring astringents. The fruits as well as the gum are reported to be aphrodisiac. The ground spike-paste is recommended for acne.

Indications

1. Diarrhoea and dysentery.
2. General weakness.
3. Small wounds and inflammation.
4. Acne vulgaris.

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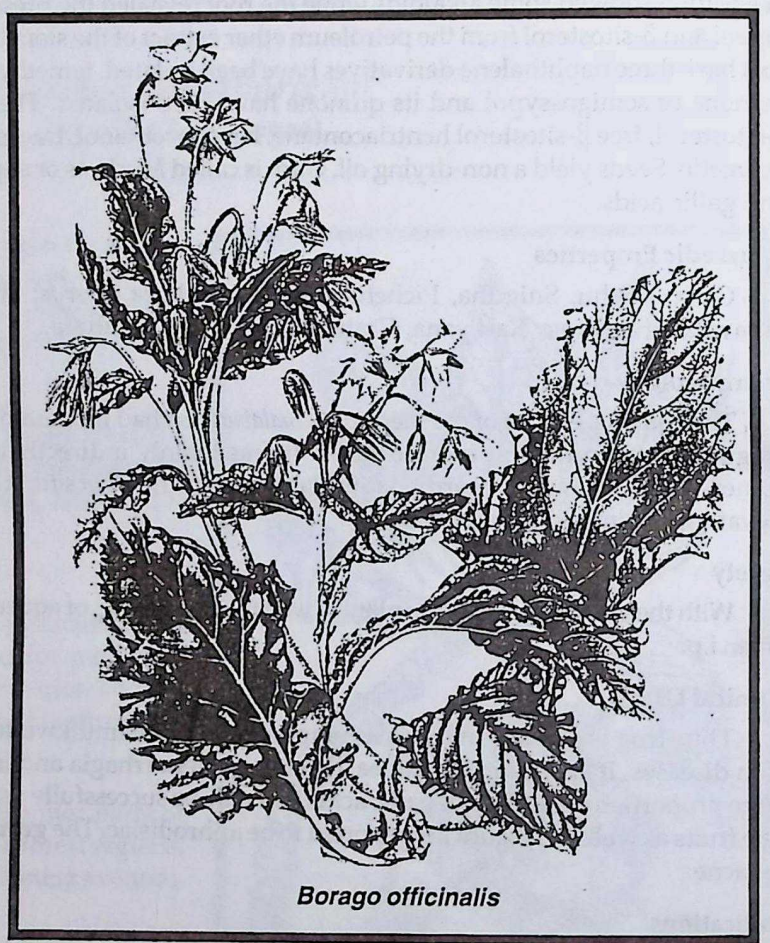
Formulations and Dosage

1. Mocharasa (gum): 1 part and Indrayana 2 parts powder: 300-500 mg t.i.d.
2. Shalmali: Root powder: 0.5-1 g b.i.d.

Borago officinalis
(Family: Boraginaceae)

Botanical Description

An annual herb with a taproot and a branched stem bearing many alternate, pointed ovate and sessile leaves with undulate margins. The basal leaves are stalked and are arranged in a rosette. The bright-blue, star-shaped flowers are clustered in loose, terminal, monochasial cymes. The prominent black anthers form a cone in the centre of the flower. The fruit consists of four brownish-black, rough nutlets (mericarps). All parts of the plant are roughly hairy. The leaves and flowers have a smell and taste of fresh cucumbers.



Borago officinalis

Habitat

Borage is indigenous to the Mediterranean region from where it has spread to other parts of Europe. It has long been grown in gardens as a medicinal herb and because it is an excellent source of nectar for bees. In the British Isles Borage has become established as a garden escape on waste ground, usually near buildings, but generally it is uncommon in the wild. The origin of Borage's name is obscure. It may be derived from an old word meaning rough-hairy, and this then gave rise to the French name *bourrache* for the plant. There may also be a connection with the Arabic words *'abu 'arak* (literally 'father of sweat') because of its ancient use as a diaphoretic.

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Constituents

Lycopsamine and supinidine viridiflorate detected in plant.

Uses

The flowering stems, sometimes just the flowers and leaves on their own, are used medicinally. The constituents include tannins, saponins, mucilage, silicic acid and minerals. Borage has anti-inflammatory, mild diuretic, diaphoretic and demulcent properties; it is also a good general tonic. In herbal medicine it is used infusions for urinary infections, colds, bronchitis and rheumatic conditions. Externally it is used in compresses for skin rashes.

Young fresh Borage leaves have a high concentration of vitamin C and area a tasty addition to salads. The fresh flowers can be candied and used for decoration. They also make an attractive addition to a wine and fruit cup.

Boswellia serrata, Roxb.

(Family: Burseraceae)

Vernacular Names

Sans.–Shallaki; *Hind.*–Salai.

Parts Used

Bark, gum.

Historical Aspects

A Sanskrit name Gajabhakshya–implies its ingestion by elephants. It has been described as useful by Charaka, Bhavamisra and others.

Habitat

It grows widely on dry hills throughout most of India but more in north west.

Botanical Description

It is a deciduous medium-sized tree, with ash coloured, bark, peeling off in thin flakes. Young shoots and leaves pubescent. *Leaves* are long, opposite, sessile, variable in shape, ovate or lanceolate, crenate-serrate, obtuse, base acute and rounded. *Flowers* in auxiliary racemes, shorter than leaves. *Calyx* pubescent outside, lobes broadly triangular ovate. *Petals* long ovate. *Drupe* tringonous.

Pharmacognosy

The macroscopic and microscopic features are well described.

Phytochemistry

Gum contains arabinose, galactose, xylose, diastatic enzymes galacturonic acid, digitoxose, rhamnose, the volatile oil obtained from gum oleo-resin contains α pinene, α phellandrene, sesquiterpene alcohols, anisaldehyde phenols. Aqueous fraction gave polysaccharides A and B. Three triperpene acids, α, β, and γ–boswellic acids have been reported. The anti-inflammatory and anti-arthritic properties are attributed to the presence of β-boswellic acid and related triterpene acids.

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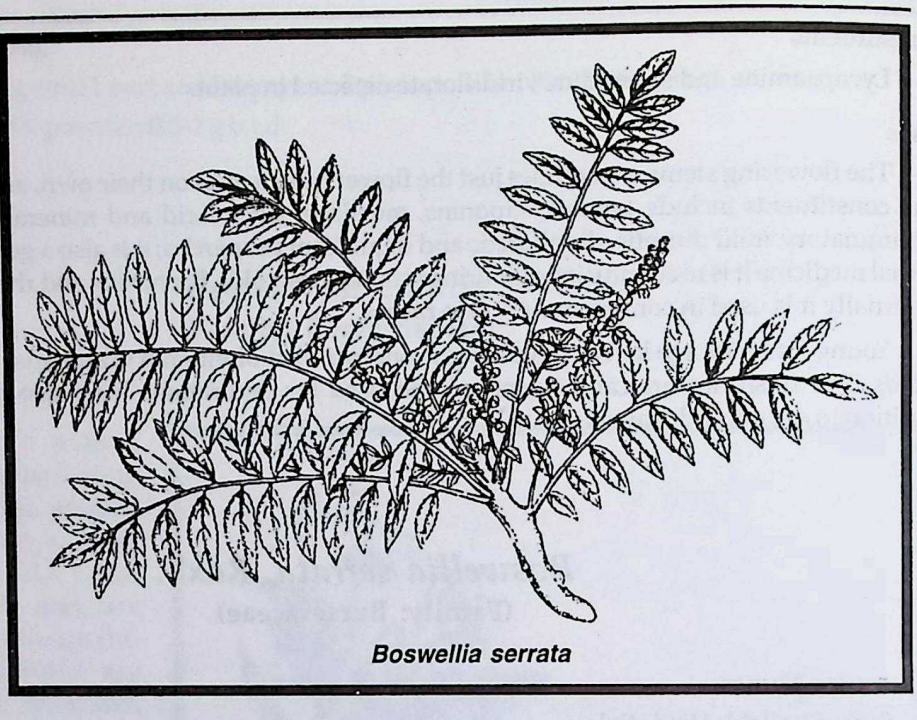

Boswellia serrata

Ayurvedic Properties

Guna: Guru, Snigdha. *Rosa*: Madhura, Tikta, Kashaya. *Veerya*: Sheeta. *Vipaka*: Katu. *Dosha*: Kaphavatahara. *Karma*: Grahi, Rochana, Vranaropana.

Pharmacology

When tested on Ehrlich ascites carcinoma and S-180 tumours transplanted in mice, it increased the life span of mice by 24 per cent with ascites and decreased S-180 tumours by 24 per cent. The essential oil of *Boswellia serrata* was found to be antifungal. Anti-inflammatory activity and antibacterial activity of extracts have been demonstrated. The non-phenolic fraction of gum resin exhibited sedative and analgesic effects when tested in rats. The chemistry and pharmacology of the gum has been reviewed.

Safety

With the recommended doses side effects are uncommon. Occasionally patients may complain of heartburn or warmth of hands and feet.

Clinical Usage

It is used in rheumatic disorders. It is also used to improve appetite and in general weakness. It has an antidiarrhoeal action.

Indications

1. Rheumatic disorders
2. Dyspepsia
3. Diarrhoea.

Formulations and Dosage

1. Oleo-resin: 1-2 gms t.i.d.

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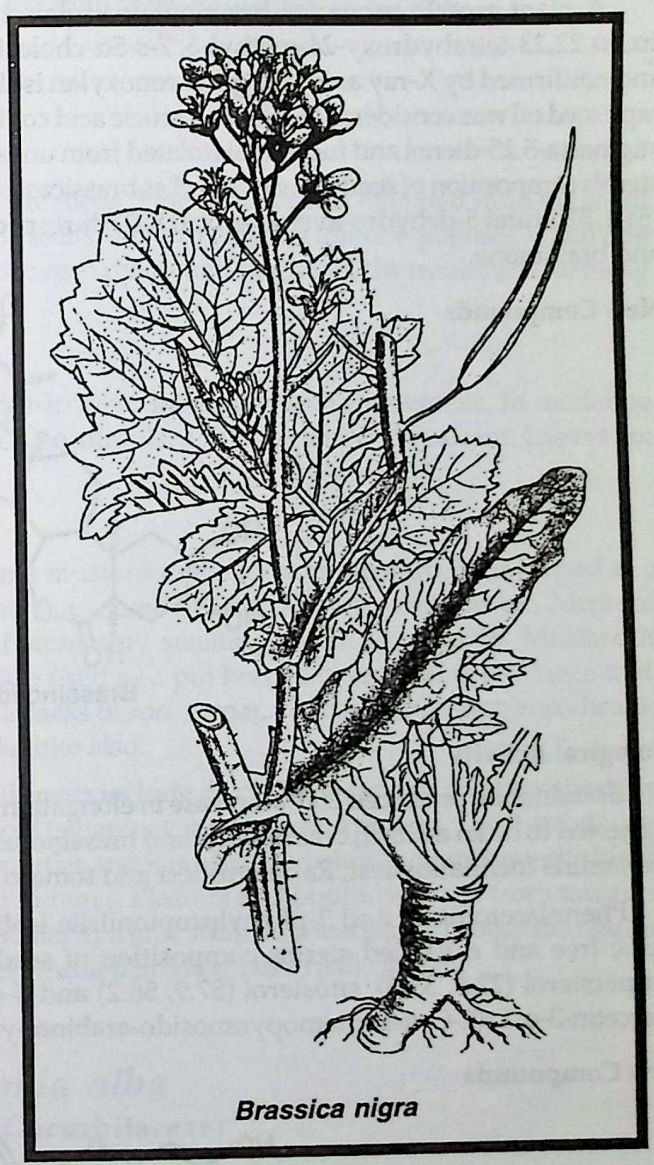
Brassica nigra, Linn. & Koch
(Family: Cruciferae)

Vernacular Names

Sans.–Sarshapah; *Eng.*–Black mustard; *Hind.*–Kalorai, Banarsi-rae, Makra-rai; *Pers.*–Sar-shaf; *Ben.*–Krishnrai; *Sind.*–Ahur; *Guj.*–Rai; *Tel.*–Avalu; *Tam.*–Kadagu; *Mal.*–Kaduka; *Can.*–Karisasivey; *Mah.*–Mohori; *Bom.*–Rai-sarson; *Hind. & Kumaon*–Kalisarson; *Fr.*–Moutarde noire; *Ger.*–Scwarzary-senf; *Kon.*–Kalen-sasam.

Botanical Description

An annual herb with a slender taproot and an erect branched stem. The leaves are alternate and stalked; the upper ones smooth, lanceolate and entire, the large lower ones bristly, lyrate and pinnately divided with a large terminal lobe. The bright-yellow flowers are prominently veined and are arranged in raceme that increases in length as the flowers fade in succession. In the related White Mustard (*Sinapis alba*) the sepals spread out horizontally below the yellow petals. The fruit of Black Mustard is a narrow, beaked siliqua with globular black seeds.



Brassica nigra

Habitat

Largely cultivated in India for the fixed oil which it yields.

Black Mustard is native to Europe and Asia but it has been cultivated as a condiment and for medicinal purposes for 2,000 years or more. It is probably native to the British Isles; it is locally common on cliffs and stream banks and, where it is a relic of cultivation, on roadsides and waste ground. It is a member of the cabbage family and its generic name, *Brassica*, means cabbage in Latin. The common name Mustard is thought to derive through the French word *moustarde* from the Latin words *mustum* (= must, a newly pressed grape juice) and *ardens* (= fiery) because originally the condiment was made by adding must to crushed mustard seeds.

Constituents

Steam volatile content of seed oil was 0.38%; 3-butenyl isothiocyanate, 2-phenylethyl isothiocyanate and phenyl acetonitrile isolated; free and esterified sterols composition of seed oil was found to be brassicasterol (12.7, 5.5), campesterol (28.2, 36.3), sitosterol (58.0,52.6) and 5-dehydro-avenasterol (1.1, 5.6% respectively).

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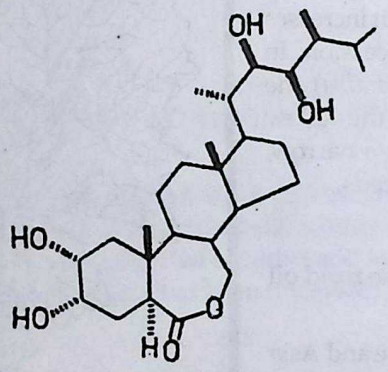
Steam volatile oil content of seed oil ranged from 0.11-0.73%; allyl isothiocyanate, dimethyl trisulphide, butyl isothiocyanate, 3-butenyl isothiocyanate and 2-phenylethyl isothiocyanate isolated; detection of 3-butenonitrile, n-butyl isothiocyanate, allyl isothiocyanate, dimethyl trisulfide, phenylacetonitrile, 3-phenylpropionitrile, 3-phenylpropionamide and 2-phenylethyl isothiocyanate in essential oils from flowers, stems, leaves and roots by GLC; free sterol and steryl ester composition of seed oil determined as brassicasterol (19.2, 9.1), campesterol (23.6, 34.0), sitosterol (57.2, 55.2) and 5-dehydro-avenasterol (x, 1.7% respectively); C-24 configuration in 22-dehydrocampesterol determined as S; isolation of 24-methylene-25-methylcholesterol from seeds.

A plant growth promoter–brassinolide–isolated from pollen, characterised as (22R, 23R, 245) 2α,3α,22,23-tetrahydroxy-24-methyl-6, 7-s-5α-cholestano-6, 7-lactone and its structure determined and confirmed by X-ray analysis; glucuronoxylan isolated from stems; oleic acid content in summer rape seed oil was considerably high and erucic acid content was very low; trans-22-dehydrocholesterol, stigmasta-5,25-dienol and fucosterol isolated from unsaponifiable matter of seed oil; free and esterified sterols composition of seed oil was found as brassicasterol (14.1, 6.5), campesterol (31.0, 37.9), sitosterol (54.1, 52.2) and 5-dehydro-avenasterol (0.8, 2.5% respectively); stereospecific synthesis of brassinolide and brassinone.

New Compounds



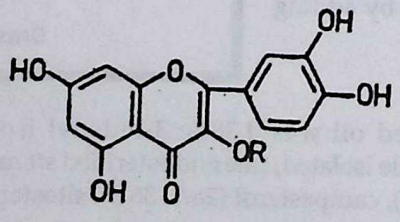
Brassinolide

Biological Activity

Brassinolide produced 200% increase in elongation in bean second-internode bioassay; fucosterol suggested to be an artifact; brassinolide and brassinone showed strong growth-promoting activity in rice-lamina inclination test, Raphanus test and tomato test at concentrations of 0.0001-1.0 ppm.

Phenylacetonitrile and 3-phenylpropionitrile isolated from volatile oil (0.26%) from Japanese seeds; free and esterified sterols composition of seed oil was found as brassicasterol (19.3, 9.5), campersterol (22.8, 33.6), sitosterol (57.9, 56.2) and 5-dehydro-avenasterol (tr., 0.7% respectively); quercetin-3-α-L-(2-O-α-L-rhamopyranosido-arabinopyranoside) (I)–isolated from seeds.

New Compounds



I

R = Ara(2→1)Rha

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Seed fat contained erucic acid as major component along with linoleic, oleic, linolenic, arachidic and palmitic acids.

Constituents

Black mustard contains Myrosin, a glucoside and Sinigrin (potassium myronate) 0.5 p. c., which acted upon by water from sulpho-cyanide of allyl, which is the volatile oil of mustard. It also contains fixed oil 25 per cent sinapine sulpha-cyanide, lecithin, mucilage, proteids and ash 4 per cent. Fixed oil obtained by expression contains glycerides of oleic, stearic and erucic or brassic acids. It is yellowish-green, non-drying, slightly odorous and of a bland mild taste. It solidifies on cooling.

Parts Used

Seeds, oil and leaves.

Preparation

Mustard is the flour obtained by grinding the seeds. Finest mustard is obtained from the small reddish-brown seeds of *B. nigra*; the larger yellow seeds of *B. alba* yielding inferior qualities. When ripe the seeds are threshed from the plants, ground between robers and pounded, the resulting flour being sifted into various grades.

Action

Externally oil is stimulant and mild counter-irritant. Internally seeds are emetic. In moderate doses they are digestive and laxative. Seeds are also stimulant, rubefacient and vesicant. Leaves are pungent and stomachic.

Uses

Powdered *seeds* combined with that of white mustard in the form of mustard flour is used as a simple vesicant and rubefacient. Mustard plasters are used in gout, sciatica, urticaria etc. Mustard poultices are useful in febrile cases and in inflammatory swellings, such as parotitis. Mustard is largely used as a digestive condiment. *Leaves* are used as a pot herb. *Expressed oil* is used as a diet; *externally* (locally) it is usefully applied in mild attacks of sore throat, internal congestion and chronic muscular rheumatism. Mustard is used in snake-bite also.

The seeds are used medicinally. Their constituents include glycoside-bounded oil of mustard (up to 35 per cent), the enzyme myrosinase, an alkaloid (sinapine), mucilage and protein. These substances give Black Mustard rubefacient and irritant properties and it is used medicinally to improve the blood supply to the skin and to the lungs, pleura and kidneys. Plasters and poultices made from mustard powder ease rheumatic and arthritic pain, muscular spasms, strained muscles and congested lungs; bath preparations have the same effect. *All Black Mustard preparations irritate the skin.*

Bryonia alba

(Family: Cucurbitaceae)

Vernacular Name

Eng.–Black-berried.

Botanical Description

A perennial tendril-climbing with a branched, turnip-like root and a long, brittle and roughly hairy stem that can reach a length of 5 meters. The stalked leaves are palmately lobed, like those of Ivy

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(*Hedera helix*), and roughly hairy. The tendrils are spirally coiled and arise at the side of the leaf axils. The small, monoecious, yellow-green flowers are arranged in loose terminal racemes; the male flowers are long-stalked, the female ones almost sessile. The fruit is a black berry.

Habitat

Black-berried Bryony is native to southern Europe but it has become naturalized elsewhere on waste ground. It does not grow wild in the British Isles. However, the related White or Red Bryony (*B. dioica*) is native to Britain (but not Ireland). It is locally common in hedgerows, copses and scrub in England and Wales but it thins and out northwards and westwards. *B. dioica* differs from *B. alba* in being dioecious and having red berries. *Both these species are extremely poisonous*–the sap may cause itching and painful blisters and only about a dozen berries might prove fatal for a child. They were once used medically and in veterinary practice as purgatives, but now a days are mostly used only in homeopathic preparations. The names *Bryonia* and bryony come from the Greek word *bruein* (= to grow vigorously). The common name of *B. dioica* and the specific name of *B. alba* (*alba* = white) refer to the colour of the roots, which distinguishes these species from the unrelated Black Bryony (*Tannus communis*), which has black roots and is also poisonous.

Uses

The roots of Black-berried Bryony contain several glycosides, tannins, an alkaloid (bryonicine) and resin. Together, these substances have strong purgative, diuretic, emetic, anti-inflammatory and antirheumatic actions. Tinctures of the fresh root are used in homeopathy for fevers, rheumatism, constipation and other disorders. *Neither Black-berried Bryony nor White Bryony should ever be collected and used for self-medication.*

Bryonopsis laciniosa

Vernacular Names

M.–Shivlingi; *Hind.*–Gargumaru.

Illness	:	**Snake bite-saw-scaled viper**
Test	:	A lamp is waved and the person asked to say how many he sees. Double vision is indicative of viper bite.
Part used	:	Seeds
Preparation	:	2 teaspoonful of seeds are ground to fine powder and added to 1 cup of water and stirred.
Dosage	:	2 teaspoonful of this mixture are given every hour.
Note	:	The patient should live on the verandah of his house for 5 days.
Illness	:	**Pain in arms and legs**
Part used	:	Leaves and fruit
Preparation	:	2 handsful of a mixture of leaves and fruit are ground and their juice squeezed out.
Use & Dosage	:	The juice is applied twice a day till cured.

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Illness : **Sterility due to blocked tubes in women**

Part used : Seeds

Preparation : Each day the needed amount of seeds are crushed to make a powder.

Dosage : From the 4th day of menstrual period the seed powder is taken in the morning as mentioned below:

1st day–5 seeds;

2nd day–7 seeds;

3rd day–9 seeds;

4th day onwards 11 seeds every morning till the 15th day.

Bryophyllum calycinum

Vernacular Names

M.–Ghaayamaari; *Hind.*–Zakhm-haiyat.

Illness : **Fracture**

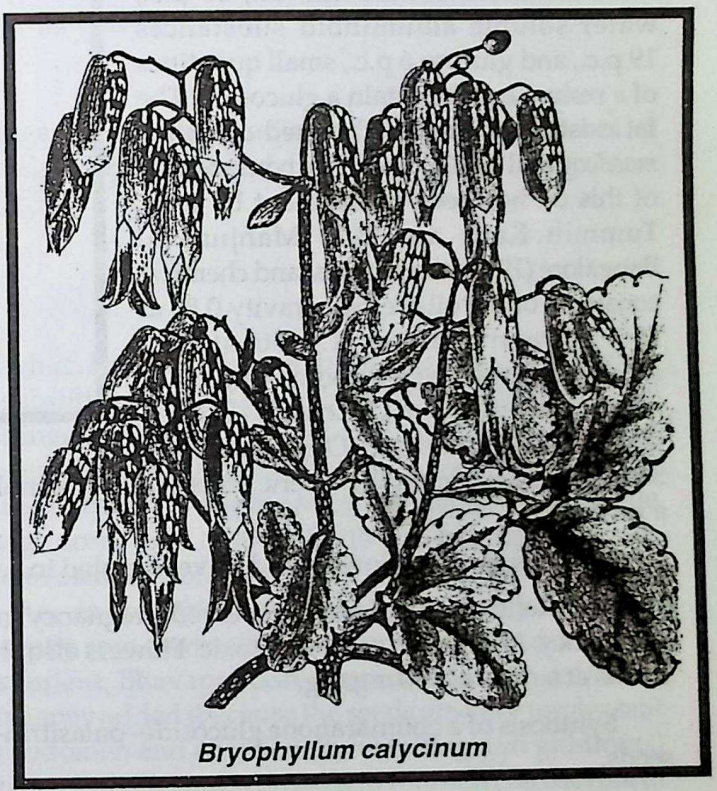
Part used : Leaves

Treatment : Leaves are crushed and tied on fracture site after setting it properly. Also half-a-cup of leaves is eaten once.

Illness : **Urinary stones**

Part used : Leaves

Preparation : Juice of leaves is prepared.



Bryophyllum calycinum

Butea frondosa, Roxb. & Koen or *B. monosperma*

(Family: Papilionaceae)

Vernacular Names

Sans.–Kinsuka, Palasa; *Eng.*–Bastard teak, (gum) Butea-gum, Bengal kino; *Hind.*–Palas, Tesu, Chichra, Dhara, (gum) Chuniagond, Faras, Kankeri, Tasu (dye); *Kon. & Mah.*–Palash, (flower) Murkampoo; *Ben.*–Palas, (gum) Kamarkas; *Gwalior.*–Beej Pak; *Guj.*–Khakara; *Pers.*–Palah, Darakhate-palasha; *Tel.*– Paladulu, Mooduga, Moduga (dye); *Tam.*–Palasam, Murkampoo (dye), Murukkanmaram; *Can.*–Muttagamara, Muttuge (dye); *Mal.*–Pilacham, Murukka-maram; *Fr.*–Butee-feuillue.

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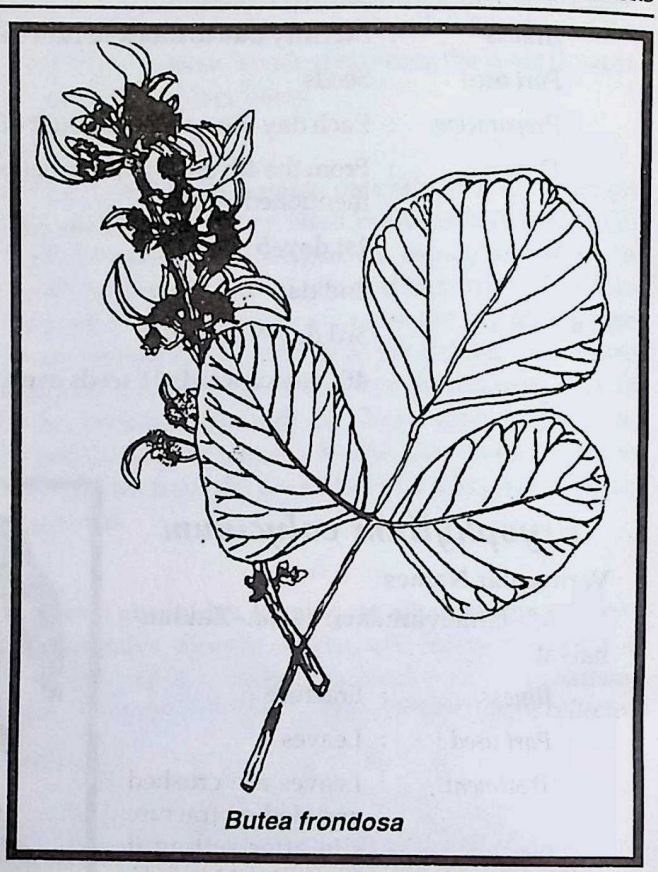
Habitat

Mountainous districts of India extending in the North West Himalayas as far as the Jhelum; and common all over Bengal and Southern India; Burma.



Butea frondosa

Parts Used

Gum, seeds, flowers, bark and leaves.

Constituents

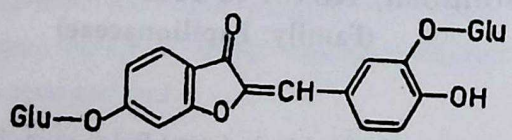
Gum and bark contain kino-tannic and gallic acids, 50 p.c., soluble mucilage and ash 2 p.c., on dry distillation it yields pyro-catachin. Seeds contain fat (oil) 18 p.c., water soluble albuminoid substances 19 p.c., and glucose 6 p.c., small quantities of a resin. Leaves contain a glucoside. The fat exists in the form of a fixed oil called *moodooga* oil or Kino-oil. The composition of this oil has been worked out by M.C. Tummin Katti and B.L. Manjunath, Bangalore (1929); the physical and chemical constants of the oil are: Sp. gravity 0.89 at 25°; refractive index 1.4650 at 25°; saponification value 174; iodine value 67.2; unsaponifiable matter 2.3 p.c. Acids isolated from the oil–Unsaturated: Oleic and linolic. Saturated: Palmitic and lignoceric acids, fraction of mol. wt. 354 and 383. The orange-red flowers yield a yellow die.

Extracts of seeds, flowers and leaves reputed to have contraceptive property.

Alcoholic extract of seed prevented pregnancy in rats at a dose of 300 mg/kg on days 1 to 4 of pregnancy. At higher dose it was toxic. Flowers also showed encouraging anti-implantation activity in rats at a dose of 300 mg/kg.

Synthesis of a coumaranone glucoside–palasitrin–from the plant; palasonin, mp. 106°, from the seeds.

New Compounds



Palasitrin

Biological Activity

Palasonin and its sodium and piperazine salts showed anthelmintic activity, minimal lethal concentrations being 1.0 and 0.75 mg/kg respectively against *Ascaris lumbricoides* of human origin.

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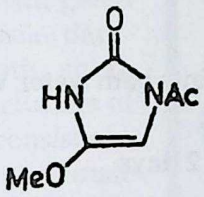
A single oral dose of sodium salt (25 mg/kg) or piperazine salt (20 mg/kg) was completely effective against *Toxocaria canis* in dogs. LD50 values (s.c.) for sodium and piperazine salts were 7.5 and 20 mg/kg respectively in mice.

Active principle of seed is an alkaloid which has physostigmine–like action as shown by specific atropine blockade, potentiation of acetylcholine responses and antagonism of curare action.

New alkaloid–monospermin–isolated and its structure elucidated.

New Compounds



Monospermin

Action

According to Chakradatta, the gum is astringent. Seeds are laxative and anthelmintic. Leaves as well as the flowers are tonic, astringent, aphrodisiac, depurative and diuretic.

Preparation

Powder and Paste of seeds; Poultice.

Uses

Bark furnishes a very important exudation which hardens into a red brittle resin known as *butea-gum* or Bengal kino or *magugo*, largely used as a substitute for the 'Kino' in India and to a limited extent in Europe also. Medicinally it is an excellent astringent similar to catechu, but mild in operation and hence is better adapted to children and delicate females, useful in diarrhoea and dysentery; the dose of the powdered gum is from 10 to 30 grains; the addition of a few grains of cinnamon and a little opium (¼ to 1 grain) increases the efficacy. In large doses of 30 to 40 grains the gum is useful in cases of phthisis and haemorrhage from the stomach and bladder. Solution of the grain is applied to bruises and erysipelatous inflammations, ringworms etc., as an astringent application. *Fresh juice* is also applied to ulcers and relaxed, congested and septic sore-throat; internally it is given in diarrhoea, dysentery and phthisis. As anthelmintic and aperient, Bhavaprakash recommends *new seeds* to be given in powder, 10 to 20 grains or as paste with honey added (because the seeds are very unpleasant to take and often produce retching pain in the abdomen and occasionally vomiting and giddiness) thrice daily for three successive days especially for ascaris-round worms) and followed on the fourth day by a dose of castor oil. For this, the seeds are soaked in water, shells removed and kernel is powdered after being dried. Some medical men consider that the seeds can be advantageously substituted for santonin against round worms. *Externally* the powder is a remedy for ringworm; it may be applied better in the form of a paste being pounded with lemon juice; also for herpes (Dhobis itch). *Externally* the leaves are used to disperse boils, pimples, buboes, tumourous haemorrhoids, etc., and *internally* in flatulent colic, worms and piles. *Flowers* also are useful. Boiled in water and applied as poultice they disperse swellings and promote diuresis and menstrual flow; they are applied in orchitis.

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Water in which flowers are boiled is given internally with nitre added in cases of difficult micturition in ½ to 1 ounce doses. *Bark* is given with ginger in snake-bites. A weak decoction of the bark is useful in catarrh, cold and cough. Bark in pieces, mixed with sugar-candy and chewed relieves abnormal thirst. Gum combined with other astringents and rock-salt is recommended by Chakradatta, as an external application for pterygium and opacities of the cornea. *Moodooga oil* is said to be practically inert and does not possess any anthelmintic activity. Active principle of the nature of alkaloid, neutral principal or glucoside could not be isolated from the seeds.

Illness : **Fever**

Parts used : Flowers

Preparation : Dry flowers are put into bath water. When the water gets coloured this is used for bath.

Dosage : This is dose for 1 or 2 days.

Illness : **Fracture**

Parts used : Bark

Preparation : Fresh bark is crushed

Dosage : After setting the fracture, crushed bark is tied and changed every 7 days.

Illness : **Foruncle**

Part used : Gum

Preparation : 2 teaspoons full of gum are put in ½ cup of water and boiled. After cooling, the sticky paste is applied.

Dosage : The paste is applied every morning, until cured.

Illness : **Low backache**

Part used : Gum

Preparation : Gum in quantity the size of dry channa is put in a cup of water, allowed to dissolve and then taken.

Dosage : Once daily for 7 days.

Illness : **Scabies with severe itching**

Part used : Dried flowers are put in water for ½ an hour. This water is used for bath.

Dosage : Once a day for 7 to 21 days.

Illness : **Whooping cough**

Part used : Seeds

Preparation : The seeds are burnt till black ash is obtained. This ash is mixed with honey and taken.

Dosage : 1 seed ash is mixed with ¼ teaspoon of honey and taken at bedtime for 3 days.

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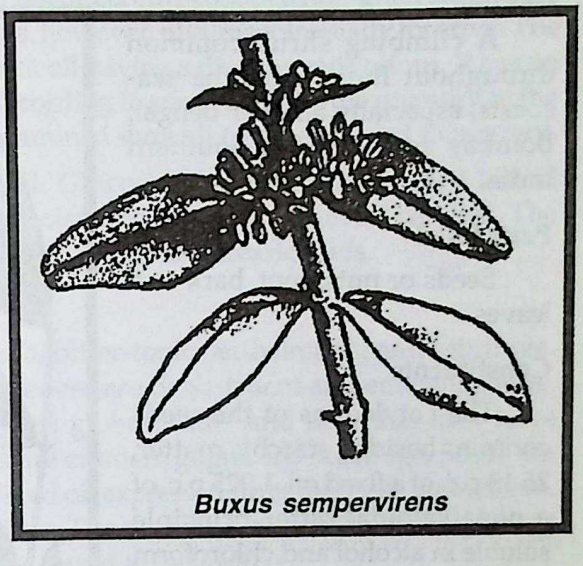
Buxus sempervirens
(Family: Euphorbiaceae)

Vernacular Names

Kash.–Chikri; *Punj.*– Papri.


Buxus sempervirens

Botanical Description

An evergreen shrub or small tree with green twigs bearing many opposite, almost sessile, dark-green, entire, ovate leaves with smooth, shiny leathery surfaces. Early in spring small clusters of whitish-green unisexual flowers, which consist of a terminal female flower surrounded by several male flowers, grow from the upper leaf axils. The fruit is an ovoid capsule. *All parts of the plant, especially the leaves and seeds, are poisonous.* Box leaves and sometimes confused with those of Bearberry (*Arctostaphylos uva-ursi*), but they can be easily distinguished by their notched apex.

Habitat

Box grows wild in central and Western Europe in woods and shrub on lime-rich soils. It is rarely found in the wild in Britain, except on the North and South Downs in southern England, but it is frequently grown as an ornamental plant in parks and gardens. The common name Box comes from the Latin word *buxus*, which in turn is derived from the Greek word *puxos* for the tree. At first boxes were made only from the wood of this species. The wood is very hard, close-grained and heavy. It does not warp and is an ideal wood for, besides boxes of all sorts, engraving plates, carvings, and musical and navigational instruments. Box was once used as a substitute for quinine in the treatment of malaria.

Uses

The leaves contain various alkaloids (for example, buxine), an essential oil and tannins, which give Box purgative, diaphoretic and antipyretic properties. *It is dangerous if taken internally and it should never be collected and used for self-medication.* In homeopathy a tincture prepared from fresh leaves is prescribed for fever, rheumatism and urinary tract infections. Symptoms of poisoning are vomiting, abdominal pain and bloody diarrhoea.

Caesalpinia bonduc, Roxb.
(Family: Caesalpiniaceae)

Vernacular Names

Sans.–Latakaranja, Putikaranja, Kuberakshi; *Eng.*–Molucca Bean, Bonducella nut, Physic nut, Fever nut; *Hind.*–Katkaranj, Katkaliji; *Mah. & Bom.*–Sagur-ghota; *Ben.*–Dahara, Nata-karanja, Natarphal;

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Duk.–Gutchha; *Tel.*–Gatchkaya, Yalakhi; *Tam.*–Kazhar-Shikkay, Gajega, Kalarkodi, Mulal, Kalangu; *Mal.*–Kalanchikuru; *Can.*–Gajikekayi; *Kon.*–Gajago; *Guj.*–Kakachia, Gajga; *Pers.*–Khayahe-i-iblis (Devil's testicle); *Fr.*–Bonduc jaune, Guilandina bonduc.

Habitat

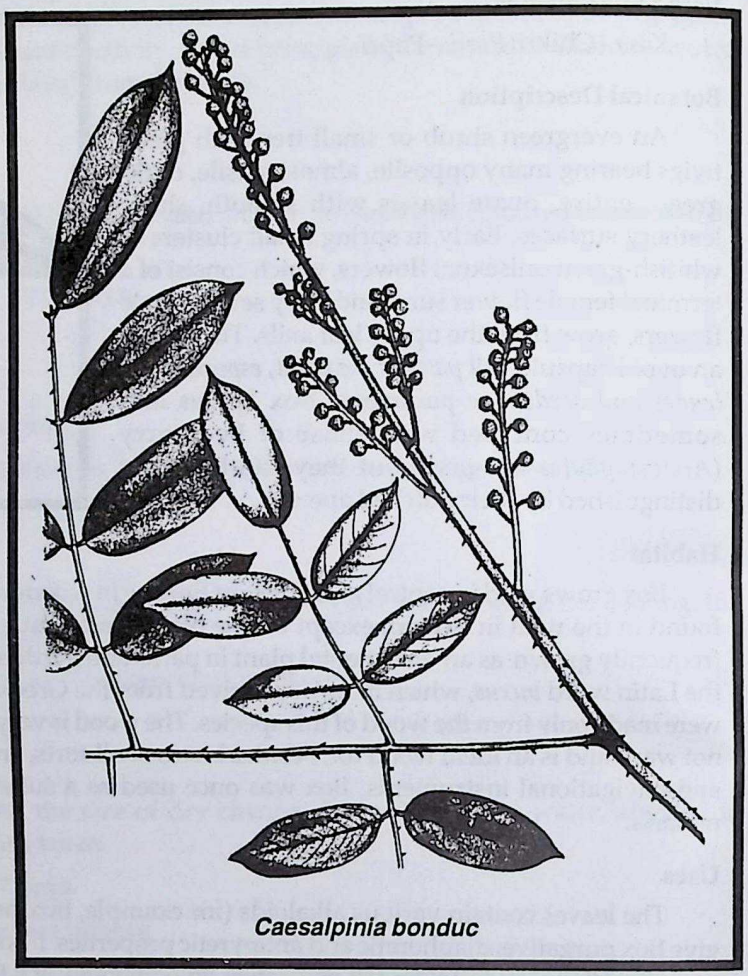
A climbing shrub common throughout India, near the sea-coasts, especially all over Bengal, Bombay and whole of Southern India.

Parts Used

Seeds or nuts, root, bark and leaves.

Constituents

The cotyledons of the seeds contain, besides starchy matter, 25.13 p.c. of a fixed oil. 1.925 p.c. of a nonalkaloidal bitter principle soluble in alcohol and chloroform and called *Natin*, but the active principle is occurred more in the bark of the root; 6.83 p.c. of sugar and 3.791 p.c. of salts. Seeds consist of 58 p.c. hard outer shell and 42 p.c. of kernel. Fatty oil from the seeds has been found to contain the glycerides of some acids, e.g., palmitic, stearic etc., two phytostererols, one m.p. 122°–123° and the other sitosterol and hydrocarbon m.p. 58°-59°. The shell contains a yellowish-white kernel.



Caesalpinia bonduc

A non-alkaloidal bitter principle was obtained from the kernels in the form of a white powder (bonducin) to which were attributed the physiological properties of the seeds. It was found to be insoluble in water but soluble in oils. Workers were able to isolate from the kernels the bitter principle bonducin which they found to be a mixture of complex resinous bodies. They could not obtain any alkaloid or glucoside from the alcoholic extract of the kernels. An alkaloid was present in the seeds and suggested the same *natin* for it. Bitter principle of the kernels extracted with alcohol, contained all the sulphur of bonducella nut and reduced Fehling's Solution after hydroysis. They concluded, therefore, that the bitter principle was a glucoside. A bitter resinous acid in the petroleum ether extract and identified it as 'bonducin'.

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In view of the divergent results of chemical analysis, the seeds were re-examined and they yielded to petroleum ether 13.52 p.c., sulphuric ether 1.84 p.c., chloroform 0.42 p.c., and absolute alcohol 18.55 p.c. of the dried extract. Each of the above fractions was then chemically examined. The presence of an alkaloid as noted by the previous investigator could not be confirmed, but a non-glucosidic bitter principle insoluble in water was undoubtedly present; it is, however, pharmacologically inactive. The seeds contain a fairly good percentage of pale yellow thick oil having a disagreeable odour. It has an iodine value of 96.1 and saponification value of 292.8. According to some workers the quantity of the oil varies between 20 to 25%; whereas in the specimens examined shows it never exceeded 14 per cent.

Percentage of nut-oil yield is 60-80; kernel yield 20%. Glucoside from the oil-extracted kernel contains most of the sulphur of Bonducella nut. It has a poisoning effect on the nickel catalyst. The acids present are in the form of glycerides of oleic, linoleic, palmitic and stearic acids.

Action

Nuts and root-bark are antiperiodic, antispasmodic, bitter-tonic, anthelmintic and febrifuge. Powdered seeds are tonic, febrifuge and antiperiodic. Leaves are deobstruent and emmenagogue. Root is a gastric tonic. Ruphius called the seeds "Frutex globulorum" and says that they have anthelmintic properties and the leaves, roots and seeds are emmenagogue and febrifuge. Seeds are considered in India and Persia to be 'very hot and dry.' Fixed oil expressed from the seeds is emollient. Yellowish-white kernel contained in the shell is very bitter. The non-glucosidic bitter principle was passed through the usual pharmacological test but it was found to be inactive.

Preparation

Powder, Oil and Ointment.

Uses

Seeds or *nuts* and the *root-bark* are valuable in simple, continued and intermittent fevers, asthma, colic, etc. Dose is 10 to 30 grains of the powdered seeds or kernel with an equal quantity of powdered black pepper; seeds are febrifuge and anti-periodic, and used in chronic fevers. Of the root-bark the dose is 10 to 15 grains. *Powdered seed* smoked in a *bucca* cures colic; mixed with warm butter-milk and asafoetidia it acts as tonic in dyspepsia. *Burnt seeds* with alum and burnt arecanut is a good dentifrice useful in spongy gums, gum boils etc. A *cake* made of 30 grains of powdered kernel, the contents of an egg and fried in ghee is a valuable remedy, taken twice a day, in cases of acute orchitis, ovaritis and scrofula. *Ointment* made from the roasted seeds with castor oil forms an excellent application to hydrocele, acute orchitis and glandular swellings. Seeds are useful for dispersing swellings, restraining haemorrhage and keeping off infectious diseases; are also roasted and powdered, and given internally in hydrocele and in leprosy. A decoction of the roasted seeds is used against consumption and asthma. *Tender leaves* are efficacious in disorders of the liver and the *oil* expressed from them is useful in convulsions, palsy and similar nervous complaints. Tender leaves boiled with castor oil or ghee and thickly applied on painful and swollen testicles are found to be very efficacious. Fixed oil expressed from the seeds is a remedy in discharges from the ear; is used as an embrocation in rheumatism, and to remove freckles from the face as a cosmetic.

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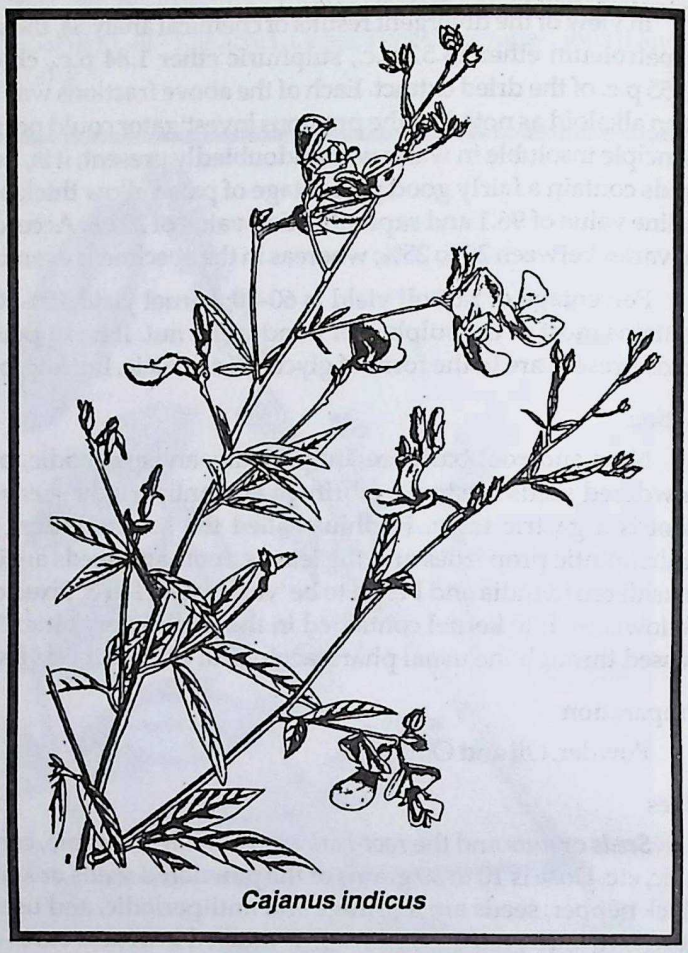
Cajanus indicus
(Family: Papilionaceae)


Cajanus indicus

Vernacular Names

Sans.–Adhaki, Tuberika, Tuvari, Soopyah; *Eng.*–Pigeo Pea, Cadjan Pea, Congo Pea; *Hind.*–Tor, Arhar dal, Punj. & *Ben.*–Arhar; *Guj.*–Tuver, Dangri; *Mah.*–Tur; *Kon.*–Tot; *Tel.*–Kandulu; *Tam.*–Adagi, Tuvarai; *Mal.*–Adhaki, Tuvara, Catjan; *Can.*–Togari.

Habitat

Extensively cultivated throughout India, especially Southern India, as an article of food. White-seeded variety extensively cultivated in Gujarat, and red or brown seeded variety generally cultivated in other parts of the Bombay Presidency.

Varieties

Khandesh Red; Nadiad Red; Baramati White; Bangalore Red; Salam Red; Bangalore Variegated; Sambalpur.

Parts Used

Seeds or beans and leaves.

Constituents

This pulse which have three varieties, *viz.* yellow, red and white, contains food elements-nitrogenous matter, fatty matter, starch or carbohydrates, nutritive salts and watery matter.

Analysis of Unsplit grains with husk

	Deccan	*Gujarat*
Moisture	6.96	6.32
Ether Extract	2.50	1.50
Abuminoids	19.57	20.75
Soluble carbohydrates	60.77	60.77
Woody fibre	6.70	6.40
Ash	3.50	4.26
	100.00	100.00
Containing Nitrogen	3.13	3.32
Sand	nil	nil

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An Analysis of *tur* (split grain with husk removed) showed the following result:

In Deccan Tur: Moisture 6.00; Ether Extract 1.60; Albuminoids 21.12 (containing Nitrogen 3.38); Soluble carbohydrates 66.88; Woody fibre 1.10 and Ash 3.30 (containing Sand 0.43) per cent.

In Gujarat Tur: 2.52; 1.35; 22.89 (containing Nitrogen 3.66); 66.31; 1.00 and ash 2.93 (containing Sand nil) per cent, respectively.

In Cawnpore Tur: 6.64; 1.60; 19.93 (containing nitrogen 2.87); 67.47; 1.40; 2.96 (containing sand trace).

Cawnpore Tur White: 10.87; 1.46; 14.25 (containing nitrogen 2.28); 63.68; 6.22; 3.50 (containing sand 0.05).

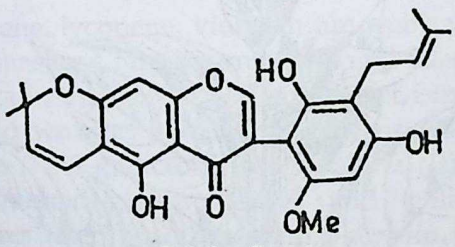
Cawnpore Tur Red: 10.94; 1.03; 16.62 (containing nitrogen 2.66); 62.92; 4.76; 3.73 (containing sand 0.05).

Action

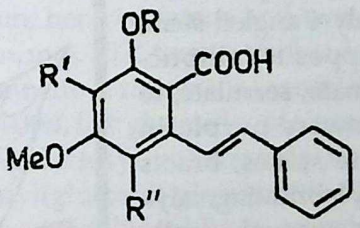
Pulse is nutritive, but 'hot and dry'. Of the 3 varieties C. flavus (pigeon pea) is the best.

A new isoflavone–cajaisoflavone–isolated from root bark; two new stilbene-2-carboxylic acids (I, II) along with pinostrobin chalcone isolated from leaves infected with *Botrytis cinerea*; two new isoprenylated isoflavones (III, IV) along with cajanin and cajanol isolated from plant incubated in presence of its native microflora; their structures determined.

New Compounds



Cajaisoflavone

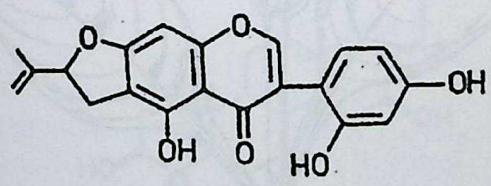


I

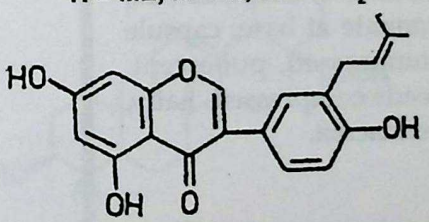
R,R'' = H, R' = CH_2CHCMe_2

II

R = ME, R' = H, R'' = CH_2CHCMe_2



III



IV

Extracts of influoresence from various solvents showed antibacterial activity; purification of acetone extract led to 10-fold increase in bactericidal activity.

Triacylglycerols, fatty acids and α-carotene isolated from seeds.

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Uses

Green pods of *tur* are eaten as a vegetable. Ripe pulse is split and eaten boiled in a variety of ways. Yellow split pulse or *dal* is in common use, being made into porridge and mixed with vegetables and is little less valuable than gram. This *pulse* is easily digested and therefore suitable for invalids; but is regarded as hot and dry as it produces costiveness. It is largely used in preparing a *soup* widely appreciated by classes, *but this soup is contra-indicated in the "Pitta" and "Vayu-Pitta" forms of diarrhoea. Leaves* are used in diseases of die mouth. Pulse and leaves ground into a *paste*, warmed and applied over the mamma has the effect of checking the secretion of milk. Tender leaves are chewed in cases of aphthae and spongy gums. *Expressed juice* of the leaves is given with a little salt in jaundice. A poultice made with the seeds will reduce swelling. The drug is used in snake-bite also. Outer husk of the seed with part of the kernel, sold under the name of *chuni* (Marathi) is a favourite food for milch cattle. Leaves and pod shells are a valuable addition to innutritious fodder.

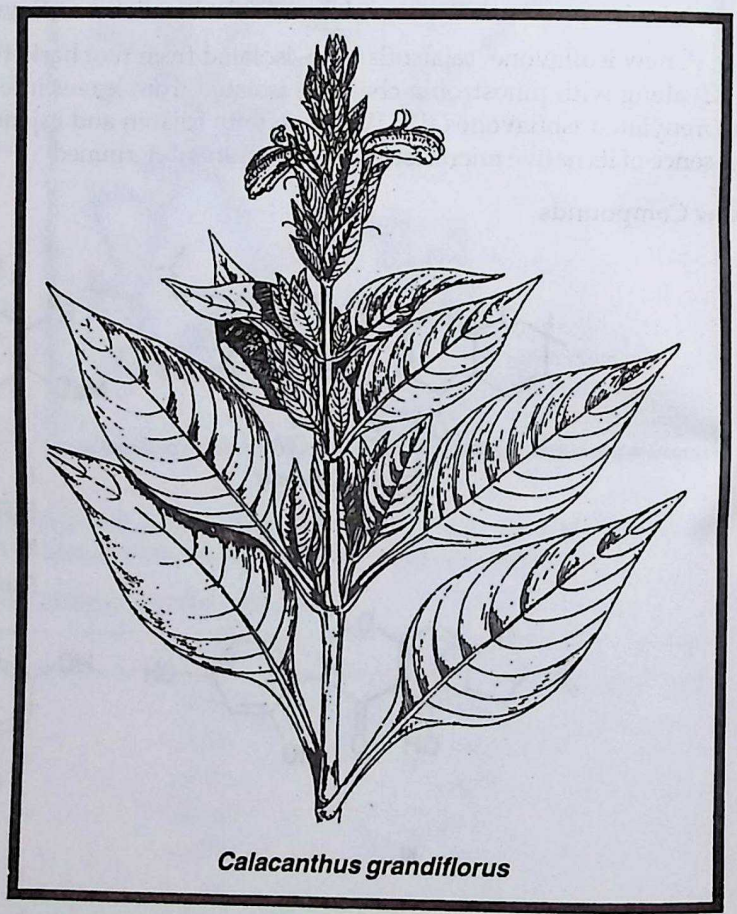
Calacanthus grandiflorus

(Family: Acanthaceae)

Profusely branched, gregarious shrub with prominently swollen nodes and obtusely 4 angled stem; leaves simple, opposite, elliptic-lanceolate, acuminate, serrulate, to 26 × 8.5 cms, flowers purple in terminal bracteate spikes; bracts large, ovate, closely inbricating; calyx 5-partite, the lobes unequal, corolla purple, deeply 2-lipped, upper lip narrow, emarginate; lower lip large, shortly 3-lobed, with a yellow central groove; stamens 4, didynamous, filaments connate at base; capsule obovoid, compressed, pubescent, 2-seeded; seeds compressed, hairy, on curved retinacula.

Habitat

The plant is seen in the hills of S. Canara upto 3,000 ft.



Calacanthus grandiflorus

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Calendula officinalis, Linn.

(Family: Compositae)

Vernacular Names

Punj.–Zergul; *Eng.*–Pot Marigold.

Botanical Description

An annual herb grown in gardens since the Middle Ages for its bright-orange or yellow single or double flowers, which are decorative from summer until autumn. The basal leaves are spathulate and stalked, the stem leaves lanceolate, alternate and sessile. All parts of the plant are roughly hairy. The terminal and solitary flowerheads have sterile, tubular disc-florets and fertile, ligulate, spreading ray-florets. The fruit is a rough, curved achene.

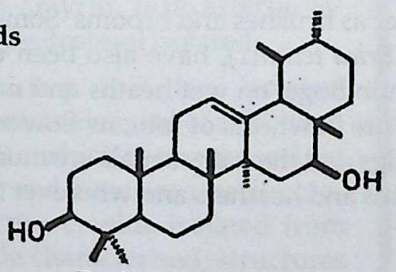
Habitat

Pot Marigold is native to southern Europe but it is easily grown in the British Isles and it is often escapes on to waste ground. The botanical name *Calendula*, a diminutive of the Latin word *Calendae* (=first day of the month) meaning 'little clock', refers to the plant's habit of flowering all year round in the wild. The double forms with bright orange flowers have the highest concentration of active ingredients and these varieties are grown for medicinal purposes on the Continent. The plant is still used in herbal medicine but not as often as it once was. The flowers have been used as a colouring agent.

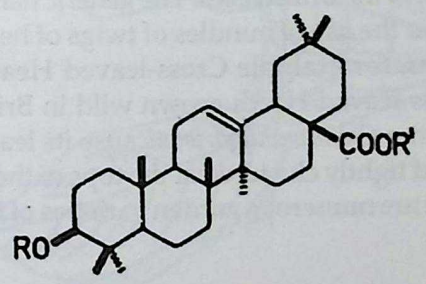
Constituents

β-Carotene, lycopene, violaxanthin, rubixanthin, hentriacontane and two phytosterols, ceryl alcohol, stigmasterol, faradiol, m.p. 196° and calendin, m.p. 153°, taraxasterol and a yellow solid, m.p. 93°, from alkaline hydrolysis of plant extract, isorhamnetin-3-rutinoside (narcissin), isorhamnetin-3-glucoside and two other isorhamnetin glycosides isolated, five glycosides of oleanolic acid isolated, 3-glucuronide (I), 3-galactosyl-glucuronide (II), 3-galactosyl-glucuronide-17-glucoside (III), 3-galactosyl(glucosyl)-glucuronide (IV) and 3-galactosyl(glucosyl)-glucuronide-17-glucoside (V) and their structures determined; α-amyrin, β-amyrin, taraxasterol, lupeol, brein, calenduladiol and arnidiol from flowers, calenduloside A, m.p. 260°, isolated and identified as galactosyl-glucoside of oleanolic acid.

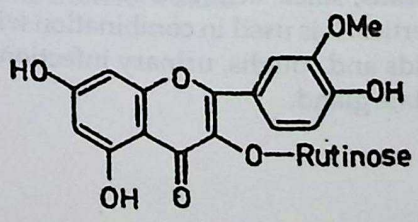
New Compounds



Brein



I
R = Gluc.acid, R' = H
II
R = Gluc.acid-Gal, R' = H
III
R = Gluc.acid-Gal, R' = Glu
IV
R = Gluc.acid-(Glu)-Gal, R' = H
V
R = Gluc.acid-(Glu)-Gal, R' = Glu
Calenduloside A
R = Glu-Gal, R' = H



Isorhamnetin-3-rutinoside

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Uses

Either the whole flowerheads or just the ray-florets are used medicinally. Among the constituents are an essential oil, pigments (carotenoids), bitter compounds, saponins, flavonoid, glycosides, mucilage and resin. These give Pot Marigold vulnerary, anti-inflammatory, choleretic and antispasmodic properties. It is not often used internally nowadays, but extracts, tinctures and ointments are sometimes used externally to heal stubborn wounds, bed sores, persistent ulcers, varicose and veins, bruises, gum inflammations and skin rashes. It is an excellent mouth wash after tooth extraction. Pot Marigold is probably more often used in complexion creams and lotions for cleansing, softening and soothing the skin. In the pharmaceutical industry the bright-orange pigments in the flowers are used to make medicinal preparations more attractive.

Calluna vulgaris
(Family: Ericaceae)

Vernacular Name

Eng.–Heather.

Botanical Description

A short, straggly evergreen shrub with densely leafy carpeting stems that root at the nodes and ascend at the tips. The short leaves are needle-like and arranged in opposite rows. The small, pale pinkish-purple flowers are clustered in dense terminal spikes. Under each flower there is a green, calyx-like involucre. The sepals are longer than the petals but of the same colour and texture. The fruit is a globular capsule enclosed in the persistent calyx and corolla.

Habitat

Heather is common and widespread throughout Europe; it grows on barren acidic soils on heaths, poor grassland, bogs and moors, where it often forms spreading masses (heather moors). It is found throughout most of the British Isles. The generic name, *Calluna*, is derived from the Greek word *kalluno* (= to sweep) after the use of bundles of twigs of heather as brushes and brooms. Some of the related species of heaths, for example Cross-leaved Heath (*Erica tetralix*), have also been used as herbal medicines. Cross-leaved Heath grown wild in Britain in bogs, on wet heaths and moors. It can be distinguished from *Calluna vulgaris* because its leaves are in whorls of four, its flowers are pink and flask-shaped and tightly clustered at the tops of the twigs and the hairy sepals are much shorter than the petals. There are numerous garden varieties of heaths and heathers and wherever they grow they attract bees.

Uses

The flowers alone or the flowering stems are used medicinally. The constituents include the flavonoid glycosides quercitrin and myricitrin, tannins, silicic acid and resin. These give Heather anti-inflammatory, diuretic and mild sedative properties. It is used in combination with other herbal preparations to treat diarrhoea, rheumatic pain, colds and coughs, urinary infections, and it is also effective against kidney diseases and enlarged prostate gland.

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Calotropis gigantea, R. Br.

(Family: Asclepiadaceae)

Vernacular Names

Sans.–Arka, Alarka, Mandara, Surya pattra; *Eng.*–Gigantic Swallowwort, Mudar; *Hind.*–Madar, Ak.; *Ben. & Bom.*–Akanda; *Pers.*–Khok, Khark; *Guj.*–Akado; *Mah.*– Ruvi, Akda, Akra; *Tel.*–Mandaramu, Ekke, Jilledu, Arkamu; *Tam.*–Badabadam, Erukku, Yercum; *Mal.*–Erikka; *Can.*–Ekkemale; *Sind.*–Byclospa; *Fr.*–Atbre-a-Soie.

Habitat and Varieties

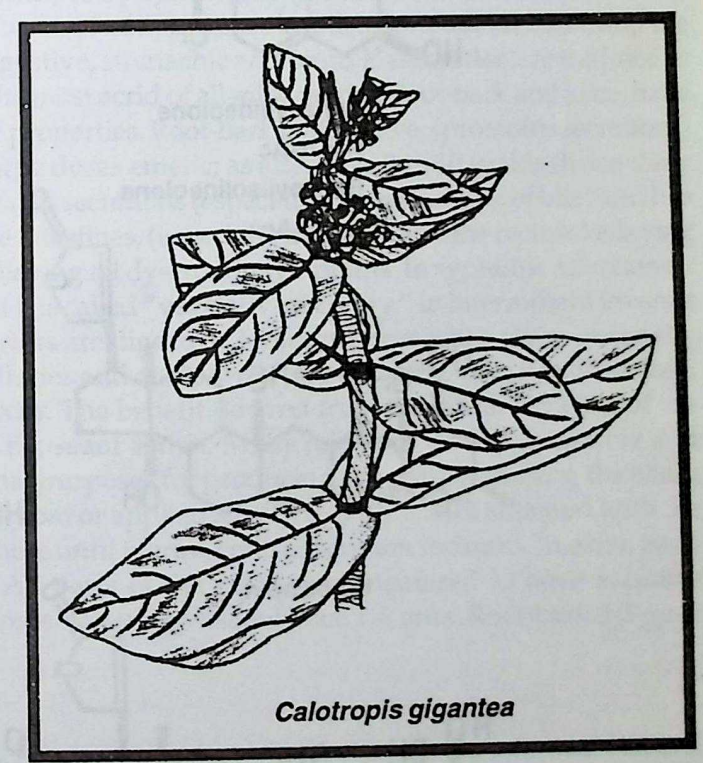
This shrub abounding in milky juice, is found chiefly in waste lands in lower Bengal, Himalayas, Assam, Punjab, Chennai, South India, Ceylon, Singapore, Malay Islands and South China.

Parts Used

Root, root-bark, leaves, inspissated juice and flowers.

Constituents

Various principles of the Calotropis bark and sap are–'Madar alban', 'Madar fluavil', closely resembling the alban and fluavil found in gutta-percha; black acid resin, Caoutchouc (free), yellow bitter resins (active principles), Akundarin and Calotropin. Quantiative experiments have shown that the root-bark from the older plants has a higher percentage of acrid and bitter resinous matters than that from the younger plants. Therefore, the older the plant the more active is its bark in its effects. The root-barks of C. gigantea & C. procera are similar in appearance and occur in short pieces 1/8 to 1/5 inch thick, and are said to contain no alkaloids.



Calotropis gigantea

α-amyrin, β-amyrin, taraxasterol, ψ-taraxasterol and β-sitosterol isolated.

Voruscharin, m.p. 165° dec., isolated from African plant; conversion of calactin to calactinic acid; calactin composed of calotropagenin and hexose; uzarigenin, syriogenin and proceroside isolated from latex; proceroside characterised; structures of calotoxin, calotropin, uscharidin and calactinic acid revised; benzoyllineolone and benzoylisolineolone from root bark.

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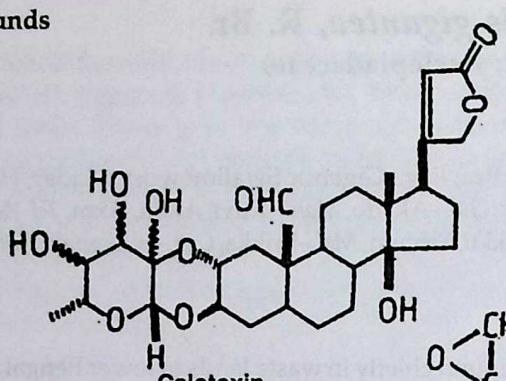
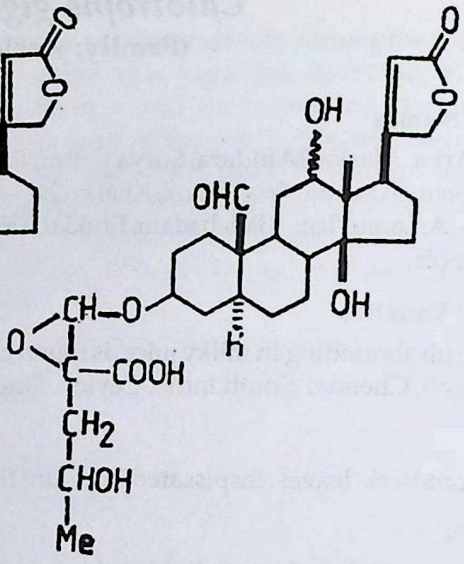
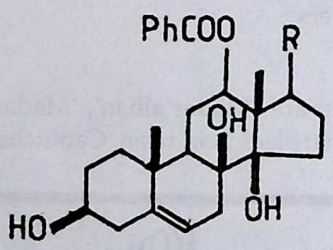
New Compounds



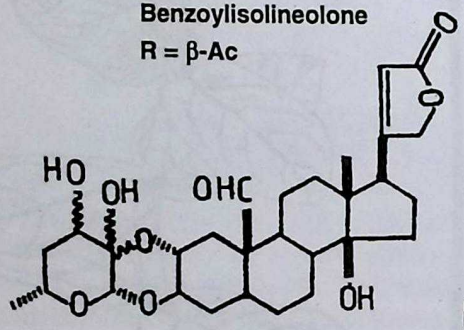
Calotoxin



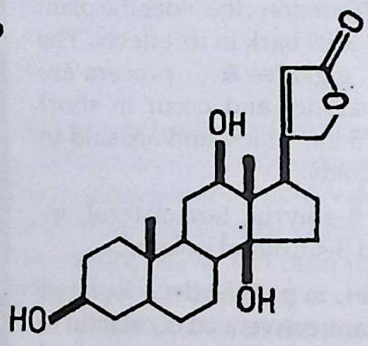
Calactinic acid



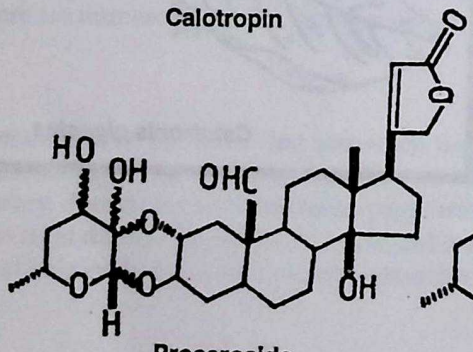
Benzoyllineolone
R = α-Ac
Benzoylisolineolone
R = β-Ac



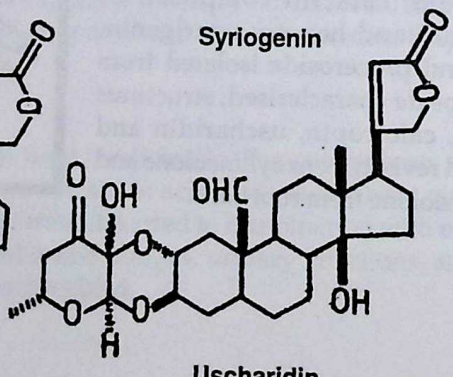
Calotropin



Syriogenin



Proceroside



Uscharidin

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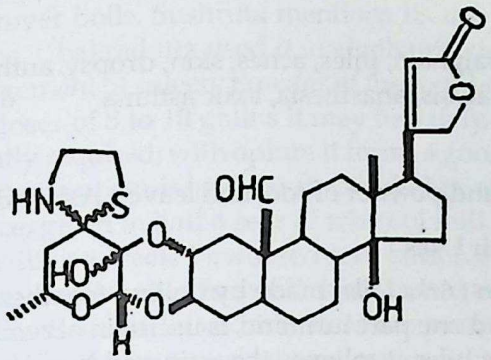

Voruscharin

Collection and Storage

For medicinal purposes the root-bark should be selected from plants as old as possible in the hot or day weather and the bark should not be removed as soon as the root is dug out, but 24 hours afterwards; the thick, rough, corky, epidermis of the bark should be scraped off before the root-bark is reduced to powder.

Action

This drug is acting like digitalis on the heart. The physiologically active substance is found in the milky juice of the plant. The taste of the root-barks of both varieties is mucilaginous and bitter, and the odour is peculiar. Flowers are considered digestive, stomachic and tonic. Hakims declare the juice as caustic, a purge for phlegm, depilatory and the most acrid of all milky juices. Root-bark and juice, have emetic, diaphoretic, alterative and purgative properties. Root-bark is alterative, (promotes secretions) tonic, antispasmodic, expectorant, and in large doses emetic; as alterative 3 to 10 grains thrice daily and as emetic 30 to 60 grains. This drug increases secretions (especially the evacuation of bile) and has a sedative action on the muscular fibres of the intestines, (especially the colon and the rectum) allaying all pain, tenesmus and irritation and thus relieving all dysenteric symptoms. In syphilitic affections it is regarded as a great remedy so much so that it is called "vegetative mercury." In intermittent fevers it is used as antiperiodic and diaphoretic. Flowers are digestive, tonic and stomachic; given internally in small doses, the drug stimulates the capillaries and acts powerfully upon the skin; it is, therefore, likely to be useful in elephantiasis and leprosy. The benefit derived from the administration of the flowers in asthma is probably due to their nauseant action. Milky juice is a violent purgative and gastro-intestinal irritant. It is used for criminal purposes for producing abortion or causing the death of new-born infants, by forcing it down the throat or applied locally, usually a stick smeared with the juice is pushed up into the os uteri and left there until uterine contractions are induced. In some parts of India it is also used as a cattle poison. All parts of the plant are considered to have valuable alterative properties when taken in small doses. *Dose*: Inspissated juice 1-2 gms. Root-bark 1-5 gms. Juice of the leaves 1 to 5 drops.

Action and Uses in Ayurveda and Siddha

Saram. Indications-Kushtum, visham, kandu, vranam, gulmam, arsas, kapodaram. *Flowers*: aphrodisiac, lagu, dipanam, pachanam, in aruchi, swasam, kasam. *Red flowers*: Madhura rasam, tikta rasam, kaphaharm, grahi, in kushtam, arsas, krimi, in raktapittam, gulmam, sodam. *Milk*: ushnam, tikshnam, lagu, snigdam, virechanam, indication in kushtam.

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Action and Uses in Unani

Hot 4°, Dry 4°, caustic, balgham, piles, aches, skin, dropsy, anthelmintic. Leaves and branches- Hot 3°, Dry 3°, resolvent, paralysis, anasthesia, toxic asthma.

Preparation

Paste or emulsion; Pills and powder of root and leaves. Ash and fluid extract of leaves and oil.

Indian Preparations and their Uses

1. An oily preparation (*Arka taila*) made by boiling together 8 parts Sesamum oil, 16 parts Calotropis juice, and one part turmeric, is useful in eczema and eruptive skin diseases. In scorpion and insect biles it relieves the pain and burning. As a depilatory it is used by women for removing hair from parts of body. It is a useful local application for the relief of painful joints and swellings, and for ringworm of the scalp. In combination with the wood of Berberis asiatica it is used as a caustic for dosing sinuses and fistula in ano.
2. Dried flowering tops 2 to 4 grains pounded and boiled with molasses, are given every morning as a remedy for asthma. Fine powder of root-bark is prescribed in cases of syphilis, lepra, hectic fever, etc. Dose from 3 to 5 grains three times in the day, gradually increased. 2 drachms dried root-bark are to be infused in half a seer of warm water. In syphilis and lepra it is taken in dose of half-a-chattak (1 oz.)
3. Take equal parts of the branches, leaves, milky juice and flowers. Press them well and make pills (of the size of a pea) and dry them in the sun. One pill given every morning in various kinds of skin diseases.
4. *For want of virility*: Take 125 flowers, dry and powder them, then mix with one tola each of cloves, nutmegs, mace and pellitory root, and mike into pills of 6 massas each. One pill may be taken daily dissolved in milk.

Uses

An intoxicating liquor is said to be prepared from the juice of the plant. The sacred 'Soma' juice of the ancient Sanskrit writers has by many botanists been associated with a species of plant, belonging to a tribe not very far removed from Calotropis. The plant is said by the Arabs and Persians to yield a sugar or manna, but no definite information regarding this property is available. The manna said to be obtained from the plant is known in the bazar as 'Sakkur-el-ushai' and is said to be produced through the parasitic action of Larinus ursus. The drug is used in leprosy, constitutional syphilis, mercurial cachexia, syphilitic and idiopathic ulcerations, dysentery, diarrhoea and chronic rheumatism. Root-bark is useful in skin diseases, elephantiasis, enlargement of abdominal viscera, intestinal worms, cough, ascites and anasarca etc. Root-bark reduced to a paste with sour conjee (rice-vinegar) is applied to elephantiasis of the legs and scrotum. Milky juice of *C. gigantea* and Euphorbia nerii-folia, are made into tents with the powdered wood of *Berberis asiatica*, for introduction into sinuses and fistula in ano; it is also recommended for ringworm of the scalp, painful joints, swellings etc., to destroy piles, and is applied to ulcers to hasten their healing. Mixed with honey it is used in aphthae of the mouth and with a piece of cotton wool it is inserted into hollow carious teeth to cure tooth-ache; Hakim strongly recommends it in leprosy, hepatic and splenic enlargements, dropsy and worms. Milky juice is regarded as a drastic purgative and is generally used as such in combination with the juice of Euphorbia neriifolia. Dried juice is insoluble in water; it may be administered in the form of pills. Root tied up for tertiary (intermittent fevers) or malarial fevers, cures fevers rapidly. Charaka recommended its root-

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bark in piles, and leaves to cover boils. Sushruta mentions its use in ear-ache, asthma, dog-bite. Vagbhatta used it in toothache. Chakradatta used it in elephantiasis, hydrocele and scorpion-bite. Bhavaprakasa used it in enlargement of spleen. Powder of the root-bark is an excellent substitute for ipecacunha in dysentery; in doses of 5 to 10 grains it may be safely, substituted for ipecac, though double that quantity is generally required; with opium it forms a good representative of the officinal Dover's powder; in chronic rheumatism it is given suspended in mucilage and water; with black pepper twice a day in jaundice; given in half a seer of whey of milk with half a drachm of sodium carbonate, jaundice is cured within a week. Powdered root-bark is smoked like tobacco in syphilis. Bark, root and dried milky sap may be used in small doses in certain cutaneous affections, such as leprosy and secondary syphilis. Root-bark is administered to promote secretions, and is useful in enlargements of the abdominal viscera, intestinal worms, cough, ascites, anasarca, etc. Powder of the root in 3 to 5 grains promotes gastric secretion and acts as a mild stimulant and may be given with carminatives in dyspepsia; it is also given as a febrifuge. Tender and fresh leaves may be used along with ghee or tailams, to cover inflamed areas according as the wound requires *Samana* or *Sodhana* treatment. Fresh leaves slightly roasted, are also used as application to painful joints, swellings etc. Oil in which leaves have been boiled, is applied to paralysed parts. Tender leaves are also useful in ascites and enlargement of the abdominal viscera-they are mixed with quarter the quantity of rock-salt, roasted in closed vessels so that the fumes may not escape, and the ashes thus produced are given with whey. A fluid extract of leaves (1 in 1) given in doses of 10 to 20 grains and in 1 to 5 drops in intermittent fever during intermission will cut off the paroxysm more effectually than quinine. A powder of dried leaves is dusted on wounds and ulcers to destroy excessive granulation and to promote healthy action, or mixed and boiled with sweet oil and turmeric added, it is applied to eczema, other skin eruptions, old sores and ulcers, and to paralysed parts. This drug is employed to cure all kinds of fits, epilepsy, hysteria, lock-jaw, convulsions in children, paralytic complaints, cold sweats, poisonous bites and venereal complaints. *Flowers* are used in cough, catarrh, asthma and loss of appetite. Dried flowers in 1 to 2 grain doses with sugar are given in leprosy, secondary syphilis and gonorrhoea with milk diet.

Calystegia sepium
(Family: Convolvulaceae)

Vernacular Name

Eng.–Hedge Bindweed.

Botanical Description

A perennial climbing herb with fleshy, creeping rhizome and bluntly angled stems up to 3 metres long that twine anticlockwise and branch at the tips. The large leaves are triangular ovate to sagittate, dark green above and pale green below. The large white, rarely pinkish, funnel-shaped flowers grow singly on long talks in the leaf axils. The five sepals are partially hidden by two large, sepal-like bracts, which give the plant its name. *Calystegia* is derived from two Greek words, *kalyx* (= a cup) and *stege* (= a covering). The fruit is a globose capsule with dark-brown seeds. The flowers produce great quantities of pollen and so are attractive to bees.

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Habitat

Hedge Bindweed grows in hedges, fens, damp thickets and waste places. It is also a troublesome weed in gardens. It is widespread in the British Isles but is less common in the north.

Uses

The flowering stems have medicinal action but are nowadays rarely used as a herbal remedy. The constituents include tannins, the glycoside jalapin and mucilage. These give Hedge Bindweed purgative, choleretic and mild diuretic properties. The purgative action is unpredictable and therefore potentially dangerous. *Hedge Bindweed should thus not be used for self-medication.*

Cannabis sativa
(Family: Urticaceae)

Vernacular Names

Sans.–Vijaya, Siddhapatri, Ganjika, Bhanga, Hursini; *Eng.*–Indian Hemp; *Hind.*–Ganja, Charas; Be*ng.*–Bhang, Sidhi, Ganja; *Arab.*–Khinnab; *Pers.*–Darakte-bang; *Bom. & Guj.*–Gajna; *Mah.*–Bhang; *Tel.*–Ganjayi, Jadaganja; *Tam.*–Pangi, Kanja or Ganja, Madamattagam; Can. & *Kon.*–Bhangi; *Mal.*–Kancha; *Burm.*–Segiyav; *Sinh.*–Kansa.

Botanical Description

An annual herb with an erect, hairy stem and palmately divided, long-stalked leaves with serrate edges. The plant is dioecious: the male flowers are arranged in panicles and produce large quantities of pollen; the female flowers grow in leafy spikes in the leaf axils and are pollinated by wind. The fruit is a shiny, greyish-green achene ('hemp seed').

Habitat

This pistillate plant is a native of Persia, Western and Central Asia, now largely cultivated all over India and is found wild on the Western Himalayas and from Kashmir to east of Assam; and is acclimatised to the plains of India generally. When grown in the hot regions of the tropics, the plants (especially the female plants) yield a quantity of resin possessing remarkable intoxicating properties, and on this account hemp is largely grown in India and the East.

Hemp is native to Central Asia and India but is now widely grown in other warm parts of the world for its tough fibres and drying oil as well as for its medicinal and narcotic properties. Indian Hemp (*C. sativa* var. *indica*), which is cultivated on a large scale in the far East, India and Mexico has the greatest concentration of active substances. Hemp was probably first cultivated in ancient China about 5,000 years ago and was brought to Europe for growing in the early 16th century. The restrictions on growing and using Hemp for medical purposes vary from country to country. *In the United Kingdom it is illegal to grow, possess or sell Hemp without a government permit.* Occasionally seeds germinate on waste ground but the plant usually grows unrecognised. The common name, Hemp, comes from the Anglo-Saxon word *henep* for the plant.

Constituents

Cannabis smoke or placebo smoke administered in female rats throughout gestation and offspring injected with THC 2 mo prior to mating. Male and female offspring of experimental animals were less

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fertile and had smaller reproductive organs. Experimental F2 generation weighed less and were slower in some aspects of physiological development compared to F2 control animals; pregnant rats were administered marihuana extract (10, 150 mg/kg) from day 3 of gestation to parturition whereafter pups were culled and assigned to non-drug-treated dams. A positive control group consisting of animals prenatally exposed to alcohol (6 g/kg/day) was included for comparison. Pup weight at birth was reduced by about 10% relative to pair-fed controls in animals exposed to high doses of marihuana and by approximately 15% in pups exposed to alcohol relative to their pair-fed controls. Litter size and pup mortality birth were not affected significantly. Postnatal mortality was increased and neonatal weight was decreased at 21 days in marihuana-treated offspring. All 11 weeks of age body weights of drug-treated females but not that of males were significantly less than that of pair-fed controls.

In normal mature rats marihuana smoking caused a specific decrease in epididymal sperm after inhalation of marihuana smoke for 75 days at 16 puffs/day; chronic administration of cannabis extract (14 mg/kg for 90 days) caused testicular lesions resulting in mass atrophy of spermatogenic elements. RNA, protein and sialic acid contents of testes and epididymis were reduced, whereas alkaline phosphatase and cholesterol contents of testes were elevated; cannabis resin (10,20 and 50 mg/kg, i.p.) containing 1-dehydro-THC 17.0%, produced a dose-related potentiation of hexobarbitone (100 mg/kg, i.p.) sleeping time in mice which was significantly inhibited by agents known to reduce brain serotonin activity or enhance brain dopamine level.

Mitochondrial monoamine oxidase of human brain and liver was inhibited by low concentrations of cannabis extract and a cannabinoid fraction isolated from it but not by 1-dehydro-THC; cannabis extract administered to rats at 10 mg I-dehydro-THC/kg/day on days 11-21 of age, decreased uterine alkaline and acid phosphatase activities, when given alone. When given along with estradiol, it inhibited estrogen-induced increase in alkaline phosphatase activity and counteracted estrogen-induced decrease in acid phosphatase activity; chronic s.c. administration of cannabis extract in olive oil to male adult rats decreased microsomal oxidases and aryl hydroxylase (AHH) activity in liver postmitochondrial fraction (93.06 and 25.54% maximum inhibition respectively). Simultaneous administration of single doses of cannabis extract (330 mg/kg, s.c.) and phenobarbital (100 mg/kg, i.p.) caused inhibition of total microsomal oxidases (86.83%) and of AHH (31.86%), thus blocking the enzyme induction by phenobarbital; hashish (1-dehydro-THC, 1.6%) smoking by humans did not impair the response of T-lymphocytes to phytohemagglutinin; evaluation of neuropsychology variables and urine cannabinoid metabolites in 10 subjects born, raised and educated in United States and having histories of heavy or prolonged use of cannabis showed no impairment of cognitive function but cannabinoid metabolites were present in excess of 50 ng/ml in the urine samples; marihuana smoke and THC are toxic to lung and impair pulmonary antibacterial defence system in a dose-dependent manner. An active fraction of plant extract was effective in treatment of intestinal obstruction and was found to contain choline.

Detection on cannabinol and 9-dehydrocannabinol in seed by TLC; tetrahydrocannabivarol isolated; synthesis of cannabispiradienone, cannabispirenones A and B, cannabispirone and cannabispiranol; synthesis of cannabichromanone; flowers and leaves contained oil 0.15 and 0.08% respectively; cannabinol tetrahydrocannabinol, β-bisabolene, β-caryophyllene, β-caryophyllene epoxide, α- humulene, γ-elemene, trans-β-farnesene and α-farnesene identified in both oils; leaf oil also contained α-bergamotene whereas flower oil contained α-gurjunene, α-bisabolol, α-pinene, myrcene, limonene and terpinolene. Cannabiglendol isolated from plant grown in Mississippi and its structure determined; synthesis of cannabinol; three spiro compounds–cannabispiran,

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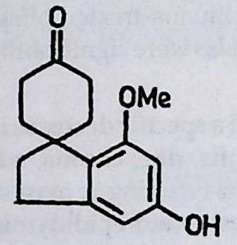
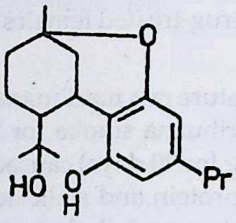
dehydrocannabispiran and β-cannabispiranol–and two dehydrostilbenes–3-[2-(3-hydroxy-4-methoxyphenyl)ethyl]-5-methoxyphenol and canniprene–isolated from plant grown in Mississippi; cannabitetrol isolated and its structure determined; isocannabispiran isolated and its structure established synthesis of cannabifuran and dehydrocannabifuran; structure of (+)cannabitriol confirmed by X-ray analysis; 3,5,4′-trihydroxybibenzyl isolated and its structure confirmed by synthesis; two new dihydrostilbenes–cannabistilbenes I and II–isolated from plant grown in Mississippi and their structures determined; synthesis of cannabisativine; synthesis of anhydrocannabisativine.

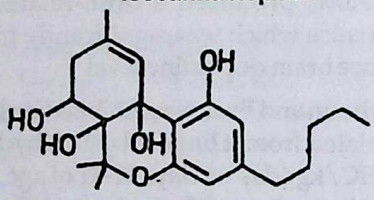
New Compounds



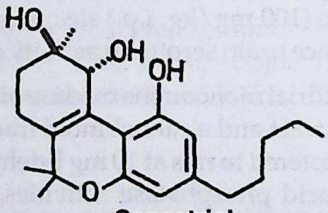
Isocannabispiran



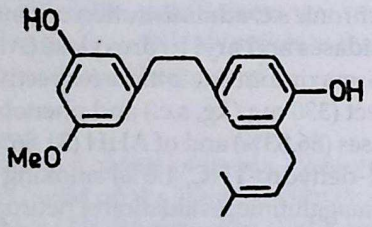
Cannabiglendol



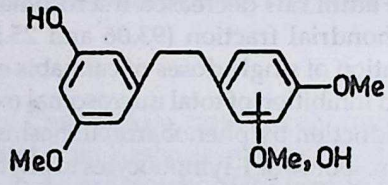
Cannabitetrol



Cannatriol



Cannabistilbene I



Cannabistilbene II

Biological Activity

Note: 1-Dehydro-tetrahydrocannabinol (1-dehydro-THC) is frequently referred to in literature as 9-dehydro-tetrahydrocannabinol (9-dehydro-THC) and similarly, 6-dehydro-THC is also mentioned as 8-dehydro-THC. In this write-up also the practice adopted in Vol. 2 has been followed: namely, 1-dehydro-THC and 6-dehydro-THC are uniformly used for 9-dehydro-THC and 8-dehydro-THC respectively, irrespective of nomenclature used in the cited publications.

Prenatal exposure of rats to marihuana extract and 1-dehydro-THC impaired Rotarod performance in female offspring but did not affect inclined plane, learning or open-field performance; effects of cannabidiol on electrically-evoked kindled seizures in conscious unrestrained rats with chronically implanted cortical and limbic electrodes were compared with those of 1-dehydro-THC. Cannabidiol

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was more effective against limbic after discharge and convulsions and was a much more selective anticonvulsant with respect to motor toxicity. It lacked central nervous system excitatory effects of 1-dehydro-THC; small doses of 1-dehydro-THC (0.05-0.15 mg/kg, i.v.) enhanced pre- and post-tetanic monosynaptic potentials in unanaesthetized spinal cats, suggesting that excitatory effects on synaptic transmission may contribute to its convulsant action. Relatively large doses of 1-dehydro-THC (0.02-0.75 mg/kg, i.v.) and cannabidiol (0.05-14.0 mg/kg, i.v.) depressed the reflex. Cannabinoids apparently produce both excitatory and depressant effects on central synaptic transmission; tolerance to, and symmetrical cross-tolerance between cannabinol and 1-dehydro-THC was observed in rabbits which uniquely exhibit behavioural convulsions with THC; in rats treated with 1-dehydro-THC or 6-dehydro-THC (5 or 10 mg/kg) 1 hr before administration of 3-mercaptopropionic acid (I) (80 mg/kg), a marked increase in latency period before convulsions and decrease in number of deaths induced by I were observed. Cannabidiol (CBD) (200 mg/kg) also increased time of latency to convulsions induced by I.

In mice running clonic and tonic convulsions and lethality were assessed following trans-corneal current or convulsant drugs, each administered alone and after CBD pretreatment. CBD prevented tonic convulsions caused by a convulsant current and by the convulsant dose of GABA inhibitors. CBD also failed to prevent convulsions and lethality caused bit strychnine, a glycine antagonist. Differential effects of CBD suggest that cannabinoids inhibit seizure spread in central nervous system by action on GABA, but not glycine, mechanisms; study of anticonvulsant action of (-) and (+)isomers of CBD in maximal electroconvulsive shock model in mice showed that both were anticonvulsant, (+)isomers being more active than (-)isomers; 6-dehydro-THC (10 mg/kg), 1-dehydro-THC(10 mg/kg), CBD (60 mg/kg) or polyvinylpyrrolidone (PVP) vehicle (2 mg/kg) was administered i.p. twice daily from day 7 through day 10 after cobalt implantation, at which time generalised seizure activity in non-treated cobalt-epileplic rats was maximal. Compared to PVP-treated controls, CBD did not alter frequency of appearance of seizures on repeated administration. In contrast, both 6-dehydro-THC and 1-dehydro-THC markedly reduced the incidence of seizures on the 1st and 2nd days of administration. On the 3rd and 4th day tolerance to the effect was evident with a return of seizures of THC-treated rats to values not significantly different from those of controls.

1-Dehydro-THC at 100 mg/kg, p.o. produced overall increase in avoidance performance in mice. At 25.0 mg/kg, p.o. it caused increase and at loo mg/kg decrease in avoidance performance in rats; 1-dehydro-THC (20 mg/kg) administered daily for 1,4,21 and 42 days to rats produced after the initial dose marked hypothermia, anorexia, adipsia and depression in locomotion, all of which disappeared within one week of treatment. But reduced growth rate and decreased rearing activity persisted throughout the 42 days treatment; tritium-labelled 1-dehydro-THC, cannabidiol and cannabinol were administered (1.0 mg/kg) to male rats which were decapitated 1, 15, 30 or 90 min later. The plasma concentration was similar throughout the time course for all cannabinoids. After 5 min, 80% of plasma radioactivity in each treatment was found to be due to metabolites. Radioactivity rapidly entered brain after administration and concentrations of unchanged cannabidiol and cannabinol in whole brain were higher than that of 1-dehydro-THC5 min after administration; 1-dehydro-THC caused nonfatal convulsions in a selected line of genetically unique rabbits. Convulsions occurred at minimal ED of 0.05 mg/kg, i.v., and increased in, severity with increasing doses (0.1, 0.5 and 0.9 mg/kg). These 1-dehydro-THC dose findings are parallel to those reported for 1-dehydro-THC-induced psychoactivity in humans; after single dose of 1-dehydro-THC (10 mg/kg, i.p.) spontaneous motor activity of rats decreased during the first hr, dopamine levels in diencephalon midbrain decreased and norepinephrine and serotonin levels decreased and increased respectively in diencephalon-midbrain and ponsmedulla.

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Following repeated daily dosing with 1-dehydro-THC, spontaneous motor activity gradually decreased from the first hr to minimum on day 5, then increased beyond normal level on day 8 to peak on day 10, then decreased again and remained close to normal from day 13 cnwards. Concomitantly dopamine and norepinephrine dcreased to their minimum and serotonin increased to its maximum. The respective brain areas on day 5, then gradually approached their normal up to day 15; healthy volunteers received CBD (1.0 mg/kg) or 1-dehydro-THC (0.5 mg/kg) or a mixture containing 1-dehydro-THC (0.5 mg/kg) and CBD (1 mg/kg) and placebo and diazepam (10 mg) as controls. CBD blocked anxiety provoked by 1-dehydro-THC, however, this effect also extended to marihuana-like effects and to other subjective alterations induced by 1-dehydro-THC.

Effects of 1-deydro-THC and CBD on pentobarbital (PB)-induced sleeping time in mice were compared after i.p., i.v. and intracerebral (i.c.) administration. For all i.p. doses used and i.v. dose of 10 mg/kg, CBD was more active than 1-dehydro-THC in prolonging sleep. In contrast, sleep was not prolonged when CBD was administered i.c., CBD (i.p. and i.v.) was also without effect when PB was administered i.c. although 1-dehydro-THC prolonged sleeping time under same conditions. Apparently 1-dehydro-THC and CBD prolonged PB-induced sleeping time by direct depressant effect on central nervous system, and by metabolic inhibition of PB respectively; effects of 1-dehydro-THC and CBD on pentobarbital (PB)-induced sleeping time were studied in male and female mice. After i.p. administration at 10, 50 or 100 mg/kg, 1-dehydro-THC and CBD prolonged sleeping time in mice of both sexes. CBD was more active than 1-dehydro-THC. 1-Dehydro-THC prolonged sleeping time after intracerebroventricular (i.c.v.) administration (5,10 or 20µg/mouse) in mice of both sexes. CBD i.c.v. prolonged sleeping time in female mice, but not in male mice.

Virgin A/J female mice were intubated daily for 8 days (short-term) or 70 days (long- term) with 0,1,5 or 25 mg/kg) 1-dehydro-THC (I) or 0,3,15 or 75 mg/kg crude marihuana extract (CME) in a sesame oil/polysorbate 80-saline vehicle. Short-term exposure to extract showed no significant effect on pregnant mare's human chorionic gonadotropin-induced ovulation but appeared to depress serum progesterone during luteal phase at highest extract level used (75 mg/kg) and inhibited female receptivity to males at least at the highest dosage. Long-term oral administration of extract or 1-dehydro-THC had no significant effect on length of oestrus cycles or mating but term pregnancies were reduced by 32 and 68% for medium and high doses respectively; administration of 3 and 6 mg/kg 1-dehydro-THC to overiectomized mice resulted in highly significant increase in uterine weights effects of marijuana extract and 1-dehdro-THC on corpuluteum function were studied on rhesus monkey *in vivo* and *in vitro*. 1-Dehydro-THC (2 mg/kg) administered i.m. on days 20, 21 and 22 of menstrual cycle decreased serum progesterone levels during the first 24 hr after treatment in comparison with untreated controls. This decrease was reversed by administration of human chorionic gonadotropin hr after drug administration.

1-Dehydro-THC (10 mg/kg, i.p. twice daily) from day 27 of age until first day of full vagine cornification, delayed sexual maturation in pubertal female rat as indicated by delayed appearance of oestrus and ovulation by an average of 4.3 days; mice treated for 5 consecutive days with 1-dehydro-THC (5 and 1 mg/kg) and cannabinol (CBN) (10 and 25 mg/kg) had statistically higher incidence of abnormal sperms than the vehicle (DMSO)-treated controls. Cytogenetic assessment 16 days after last dose showed increase in number of ring and chain translocations in spermatocytes; 1-dehydro-THC (1.0 µg/ml) *in vitro* increased ATPase and cyclic AMP phosphodiesterase activities as well as cyclic AMP content of human spermatozoa. Whereas at higher concentration (10 µg/ml), it may decrease energy metabolism since ATPase activity was not increased and cyclic AMP levels were decreased; 1-dehydro-THC (0.65 mM) decreased human sperm motility to 50% of controls; 1-dehydro-THC

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(10-50 mg/kg/day for 10 days) dose-dependently decreased levels of lipid, phospholipid and total cholesterol in testes of adult rats; 1-dehydro-THC (10 or 50 mg/kg daily, s.c. into rats aged 11-21 days) had no effect on testicular level of cholesterol; 1-dehydro-THC decreased fructolysis rate and kinetics of human rhesus monkey and rabbit spermatozoa *in vitro*. 1-Dehydro-THC-induced inhibition of fructose utilization by sperm was always associated with decrease in sperm motility.

Effects of 1-dehydro-THC on tonic prolactin secretion were investigated in long-term ovariectomised or hypophysectomised/pituitary-autografted female rats (HPAR) and in flash incubations of anterior pituitary tissue. Results suggested that not pituitary but central nervous system was the site of THC action in acute suppression of tonic prolactin secretion; plasma prolactin levels were reduced in stressed and non-stressed male-mice after single dose of 1-dehydro-THC while growth hormone levels were reduced only in non-stressed animals. Chronic treatment with THC did not affect these levels under either condition. Neither acute nor repeated exposure to THC affected plasma corticosterone levels while exposure to CBN increased plasma growth hormone levels in non- stressed mice and repeated CBN exposure reduced hormone levels in stressed animals. Moreover, chronic CBN exposure resulted in decreased peripheral levels of corticosterone in both stressed and non-stressed mice, and reduced plasma prolactin levels in stressed mice; single injection of 1-dehydro-THC (4.0 mg/kg) at 24 hr on first day of leukocytic vaginal smears of pseudo-pregnant rats delayed ensuing nocturnal prolactin surge for about 1 hr. Apparently, nocturnal surge secretion of prolactin during early pseudopregnancy in rat is sensitive to THC suppression, but this suppression is not adequate to influence duration of pseudopregnancy.

1-Dehydro-THC and CBN were tested for their ability to interact with androgen receptor in rat prostate cytosol. Both inhibited specific binding of dihydrotestosterone to androgen receptor. Thus, anti-androgenic effects associated with marihuana use result, at least in part, from inhibition of androgen action at receptor level; testosterone levels were depressed in male subjects both after smoking one marihuana cigarette and after i.v. infusion of 1-dehydro-THC and a minimum of 24 hr are required for testosterone to return to presmoking level; 1-dehydro-THC administration to intact diestrous female mice or to ovariectomised female mice altered pituitary gonadotropin release. In intact diestrous female mice treated with testosterone, THC had no effect on plasma testosterone levels but significantly increased plasma dihydrotestosterone levels when compared with mice treated only with testosterone. Thus, THC can also alter the metabolism or target tissue response to gonadal steroids; maternal exposure to 1-dehydro-THC, or to non-psychoactive CBN or CBD (each at 50 mg/kg, orally) alters endocrine functions and concentrations of brain biogenic amines in their male offspring. Prenatal CBN exposure on day 18 of gestation resulted in decreased plasma FSH and testicular testosterone levels and seminal vesicles weights, but increased plasma levels of LH and FSH post-castration in adulthood.

1-Dehydro-THC (3mg/kg, i.p.) reduced serum TSH levels to less than 10% of control; its ED50 was 0.3 mg/kg. After a 10 mg/kg dose of 1-dehydro-THC, maximum decrease in serum TSH occurred at 1 hr. Both serum triiodothyronine (T3) and serum thyroxine (T4) levels were decreased by single 10 mg/kg 1-dehydro-THC injection with maximal decrease at 6 hr post-injection. Acute treatment with 1-dehydro-THC results in decrease in circulating TSH, T3 and T4 levels; maternal exposure to 1-dehydro-THC or to CBN or CBD (each at 50 mg/kg, p.o.) altered male reproductive functions and brain biogenic amines in male and female offspring. Postnatal exposure to THC or CBN reduced body weights while testicular weights were lower in CBD-exposed. Testicular testosterone levels were also lower in CBN-and CBD-exposed animals. Postnatal cannabinoid exposure reduced plasma LH levels in intact and castrated adults. Although basal testosterone production *in vitro* was not affected by

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postnatal cannabinoid exposure, testes from CBD-exposed males were more responsive to gonadotropin stimulation. In contrast, *in vivo* responsiveness to intratesticular human chorionic gonadotropin administration was significantly reduced in THC- and CBD-exposed males.

1-Dehydro-THC and its structural analogs decreased brain hippocampus acetylcholine turnover in dose-dependent manner in unanaesthetised rats; 1-dehydro-THC decreased EEG activation and caused slow waves in cat after i.v. administration. EEG slow-wave activity was accompanied by comcomitant decrease in acetylcholine release from neocortex which suggested that THC depressed brain stem activating system. Large doses of 6-dehydro- and 1-dehydro-THC increased brain acetylcholine levels in rodents but this effect was not seen with minimal doses of cannabinoids which showed behavioural effects. The most dramatic change produced by THC is that brain acetylcholine utilisation is reduced primarily in hippocampus; in cat spinal motoneurons, 1-dehydro-THC increased amplitude of excitatory postsynaptic potentials and decreased amplitude of inhibitory postsynaptic potentials. Cannabinoids also concomitantly caused depression, as evidenced by rise in the firing threshold for motoneuron action potential; rat brain cholesterol esterase was inhibited in decreasing order of potency by 3.2-32.0 MUEM 1-dehydro-THC, CBN and hydroxy-1-dehydro-THC; 1-dehydro-THC depressed neuromuscular transmission of isolated sciatic nervesatorius muscle preparation of frog. Studies showed 1-dehydro-THC blocks neuromuscular transmission by depressing release of acetylcholine from presynaptic nerve terminals; administration of 1-dehydro-THC (1.0-2.0 mg/kg, i.v.) in cats decreased spontaneous firing and increased thermosensitivity of primary thermodetector units. 1-Dehydro-THC also increased spontaneous firing and thermosensitivity of heat-sensitive interneurons; *in vitro* effects of 1-dehydro-THC, 6-dehydro-THC, CBN and CBD were studied on uptake and release of H-labelled dopamine and norepinephrine in synaptosomal preparation of rat brain corpus striatum and hypothalamus.

CBD blocked increase in operant behaviour responses induced in rats by small doses of 1-dehydro-THC and potentiated decrease in frequency of responses induced by large doses of THC. CBD inhibtied conditioned emotional response in rats whereas THC enhanced it; acute or chronic administration of 1-dehydro-THC (10 mg/kg or 50 mg/kg, i.p.) or (10 mg/kg/day for 15 consecutive days) increased dipalmityl-phosphatidyl-choline and total phospholipid contents of semi-purified surfactants of adult rat lung; thirty two cannabinoids were tested for their ability to reduce intraocular pressure in rabbit. Certain derivatives of 1-dehydro- and 6-dehydro-THC were more active in lowering it than the parent cannabinoids; tolerance developed to cataleptogenic effects of 6-dehydro-THC and 11-hydroxy-6-dehydro-THC on daily administration (5 mg/kg, per day i.v.) of these substances in mice. Reciprocal cross-tolerance was also demonstrated between both cannabinoids. The ED50 (mg/kg, i.v.) for 6-dehydro-THC and 11-hydroxy-6-dehydro-THC were 13.0 and 5.3 respectively in 6-dehydro-THC-tolerant mice (7 days treatment) while the corresponding ED50 were 20.8 and 11.7 respectively in 11-hydroxy-6-dehydro-THC-tolerant mice. These values were much higher than those in vehicle-treated mice; 1-dehydro-THC, but not CBD, (10mg/kg, p.o.) when administered to normotensive monkey model decreased intraocular pressure; orthostatic hypotension was observed within 10 min after inhalation of 1-dehydro-THC (2%) marihuana cigarettes in male glaucoma subjects. Plasma levels of 1-dehydro-THC ranging from 57 to 233 ng/ml were found 5 min after smoking. Peripheral venodilation appeared responsible for precipitous decrease in systolic blood pressure in all subjects; male albino rats injected i.v. or i.c.v. with 1-dehydro-THC developed mydriasis. Median ED of i.v. group was 5 mg/kg whereas that for i.c.v. was 150 µg/kg. Sympathectomy significantly decreased 1-dehydro-THC-induced mydriasis, thus, it produced mydriasis through a central action; 1-dehydro-THC at 1.5mg/kg dose impaired differentiation of shorter visual signals (300-2000 ms), but did not alter

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differentiation of longer visual signals (3000 ms) in cats. At higher dose (3 mg/kg) it impaired differentiation of both shorter and longer visual stimuli.

Acute administration of 1-dehydro-THC (0.05-5 mg/kg)-induced biphasic effects on body temperature and brain 5-hydroxy-indoleacetic acid (HIAA) in rat. Smallest dose caused hyperthermia and reduction in brain 5-HIAA, whereas higher doses had opposite effects. Depending on dose, it may increase or decrease release of serotonin and this effect may be manifested as hypo- or hyperthermia respectively. With repeated injections (2 mg/kg, i.v., daily for 10 days) tolerance developed to hypothermia and to increase in brain 5-HIAA levels; 1-dehydro-THC did not show hypokinetic effect by itself in rat but produced more than 2-fold increase in hypokinesia produced by reserpine. THC (1 to 10 mg/kg) potentiation of reserpine-induced hypokinesia was observed to be both time and dose-dependent; 1-dehydro-THC and CB were found to be extreme sensitizers in guinea pig. CBD, 6-dehydro-THC and cannabichromene were moderate sensitizers. Most cannabinoids were allergenically cross-reactive; cannabichromene showed anti-inflammatory properties as effective as phenylbutazone at equivalent doses. Since former is less toxic than the latter, its larger doses may be given to produce greater therapeutic effect; 1-dehydro-THC (5 mg/kg or 10 mg/kg) produced highly significant analgesic effect against both phasic pain and tonic pain in rats in formalin test.

A volatile oil (prepared from the fruits or seeds) composed of Cannabene, Cannabene hydride, several alkaloids (Cannabinine, tatano-cannabinine, etc.), Cannabinon and Cannabin; a resin which consists of cannabinol, pseudo-cannabinol, cannabinin and several terpens. Hemipseeds yield from 25 to 30 p.c. of a greenish yellow oil becoming brownish yellow on keeping. Essential oil purified by distillation in a current of steam and extraction with ether is a mobile liquid boiling at 248 to 268 degrees. *Charas* the cannabis resin extracted from the leaves contains on chlorophyll. On analysis it was found to contain 33 p.c. of an oil. The ethereal extract from *Charas* has yielded:

1. A terpene $C_{10}H_{16}$ B.P. boiling at 160 to 180 degrees, yield about 1.5 per cent.
2. A sesqui-terpene $C_{15}H_{24}$ B.P. boiling at 258-259 degrees, yield about 1.75% to 2%.
3. A small amount of paraffin hydrocarbon $C_{20}H_{60}$ melting point 64 degrees, yield 0.15 per cent.
4. A toxic red oil or resin, $C_{18}H_{24}O_2$, termed Cannabinol, B.P., boiling at 265 degrees, 20 mm., yield about 33 per cent of the *charas* taken.

Collection and Storage

The plant attains its highest therapeutic power when grown in tropical and sub-tropical climates, in as much as it develops there a larger content of resin than elsewhere.

The plant is required to be harvested before becoming quite ripe, owing to liability to seedling. The seed loses its germinating power very quickly, hence the stock should be of one season old only. Indian seed is smaller and darker coloured than that of Europe. It should be used fresh.

The useful time for gathering leaves for preparation of *bhang* varies with the locality in which it is grown, but it is usually in the months of May and June in lower altitudes and June and July in higher places. The *bhang* obtained from some localities is regarded as superior to that obtained from others. There is no evidence to show that the cultivated plant yields a superior quality of the drug.

Parts Used

Dried flowering or (growing) fruiting tops of the pistillate plant. Leaves, seeds and reasinous exudation of the 3 varieties of *Ganja*–flat, round and powdered (*Chur*); the last is the best for medical use. The fibre is hemp; oil seeds are hemp seeds.

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Action

All parts of the plant are intoxicating (narcotic) stomachic, antispasmodic; analgesic, (anodyne), stimulant, aphrodisiac and sedative. In moderate doses the plant is at first exhilarant and powerful aphrodisiac; after a while it is sedative. Its habit leads to indigestion, body-waste, melancholia and impotence. In large doses it first produces mental exaltation, intoxication, a sense of double consciousness and finally of memory, gloominess etc.

Cannabinine is a powerful sedative. *Dose*: 1 to 4 grains. Cannabinon is also sedative in action, *dose*: ½ to 1 grain. Tanato-Cannabinine is a brownish powder, anodyne and hypnotic in action. *Dose*: 4 to 8 grains. *Charas* the resin is narcotic anodyne and also aphrodisiac. *Dose*: ¼ to 2 grains. On the whole Indian hemp is feebly anodyne, strong exhilarant, deliriant and hypnotic; antispasmodic on muscles, aphrodisiac on genital organs and diuretic on kidneys. Leaf juice is diuretic.

Cannabinol is a toxic red oil, a constituent of Cannabinon, *charas*, *ganja* and *hashish*. Leaves of Cannabis sativa are regarded as heating, digestive, astringent and narcotic. Male flowers are not more narcotic in their action than the leaves, unlike the female flower heads. Indian hemp is primarily stimulant, secondarily anodyne, antispasmodic and anaesthetic. *Charas*, the Cannabis resin is narcotic, does not cause nausea, constipation or headache as opium does.

Action and Uses in Ayurveda and Siddha

Tikta rasam, ushna veeryam, lagu, tikshnam, grahi, pachanam, moham, madam, produces pittam, sukra sthambanam, aphrodisiac, grahani, athisaram.

Action and Uses in Unani

Murakab-ul-khuva, musakin, retentive, anaesthetic, astringent. Externally sedative.

Preparation

Sabjee, Majoom (Confection), *Charas* (resin of C. sativa manufactured in Central Asia), Paste, Powder, Tincture, Poultice and oil (freshly prepared oil is greenish yellow, with a peculiar taste and smell). Hemp plant is cultivated in India for the various forms of narcotics which it yields and which have been used so largely by Indians from very ancient times. Three principal forms in which Cannabis sativa is used in India are:

1. *Ganja* consisting of the unfertilized resinous brownish-green or rusty-green coloured flowering heads or branches or shoots of the female plant, trodden and pressed by the feet into compact masses (known in the English drug markets as "guaza"), grown on the plains; the narcotic principle which is only developed in the *Ganja* in the unfertilized flowers entirely disappears after fertilization has taken place. *Ganja* has a characteristic odour. On the other hand, the plant grown on the lower hills of the Punjab and which yields.
2. *Bhang* which is of deep green colour, does not develop the narcotic property until the fruits are mature, the dried broken flower heads with chaff, leaves and fruiting shoots constituting the *Bhang* or *Siddhi* so largely used by Indians in making into a paste with milk or water and taken an intoxicating liquor *Hashish* (a preparation made from C. Sativa is at present time smoked by Egyptians) or the narcotic conserve or confection called *Majoom*.
3. The *Charas* possesses little taste, but has a powerful odour, and is of the dark-green or brown colour; it is the cannabis resin which exudes naturally on the leaves, stems and fruits, but only on plants growing on the mountain tract at an altitude of 6000 to 8000 feet. It is powerfully narcotic, chiefly used for its soothing properties in cases of mania and hysteria, and is

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smoked with tobacco. The female plant (cultivated for fibre in Kumaon and other places) yields considerable quantities of *charas*, which is sometimes smoked a *Ganja*. Various methods of preparing *charas* in India have been described:

(a) Sometimes men dressed in leather-suits or jackets pass through the fields of *C. sativa* rubbing and crushing roughly against the plants early in the morning just after sunrise and when a fall of dew has taken place. The resinous matter, whim sticks on, is then scraped off and forms the *Ganja* resin of commerce.

(b) In Kulu and the Hill States, the flower heads are said to be rubbed between the hands and the accumulated resin is scraped off.

(c) The operation is also said to be done by treading the plant with the feet.

(d) Sometimes the flowering twigs are simply beaten over a piece of cloth and the greyish white powder, which falls, is collected.

A Syrup (*Sherbat*) prepared from *C. indica* given in very small doses during convalescence after diarrhoea, is soothing.

"*Bhang, Siddhi, Subji* and *Patti* are synonymous with each other; they are the dried leaves of *C. sativa*, whether male or female, and whether cultivated or uncultivated, and are purified by being boiled in milk before use. The term has also been sometimes made to include the female flower heads as well as the leaves of the plant, and the green leaves as well as dry leaves. It is also probable that male flower heads must also enter into it as the methods of preparing *bhang* are very crude, the plant being simply dried and the leaves being separated by beating it against a block of wood or hard ground. '*Bhang*' is commonly the name given to the drink made out of '*subji*'; *ganja* pounded up and made into a drink, as is done in case of *Garhjat ganja* in Puri, also is called *bhang*. For this reason, in many parts of India, especially in the South and West the distinction between *ganja* and *bhang* is lost. *Bhang* here is the name given to the most simple style of consumption, *viz.*, pounding and drinking, which in the evolution of its narcotic use must have preceded smoking. Although *bhang* is a more comprehensive term and often includes *ganja* in the North, in South India *ganja* is a more general term and in some places is made to include even *bhang*, the latter term being quite unknown there. *Bhang* is prepared from both the uncultivated plant and a small quantity from cultivated plant. The plant is cut and is alternately exposed to sun and dew. When the leaves are dried they are pressed and stored in earthernware vessels. *Bhang* is also the name given to the refuse of the treading floor when *ganja* is prepared.

Bhang, Siddhi, Subji and *Patti* are used with water as a drink which is thus prepared: About three tolas weight are well washed with cold water, then rubbed to powder, mixed with equal parts of black pepper, dried rose-petals, poppyseeds, almonds, cardamoms, cucumber and melon seeds to which sugar, half a pint of milk and equal quantity of water are added. This is considered sufficient to intoxicate an habituated person. Quarter to half the quantity is enough for a novice. The intoxication caused by this beverage, *i.e.*, *bhang*, causes the person to sing and dance, to talk much, to eat food with great relish and to seek aphrodisiac enjoyments. The intoxication lasts about 3 hours when sleep supervenes. No nausea or sickness of stomach follows, nor are the bowels at all affected; next day there is slight giddiness and vascularity of the eyes, but no other symptoms worth recording.

Ganja consists of the dried flowering tops of the cultivated hemp plants which have become covered with the exuded resin in consequence of having been unable to set seeds freely. It is also said to be prepared from a particular variety of the wild plant known as 'ganja plant'. *Ganja*, which is called '*Ganja-yela*' in Tamil, '*Bangiaku*' in Telugu and as '*Ganja*' in Hindustani, Bengali, Marathi and

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Punjabi, is used like tobacco for smoking alone: One rupee weight or 1 to 2 grams of *ganja* and a little dried tobacco with a litt1e water are rubbed together in the palm of the left hand with the right thumb for a short time till the stuff becomes sticky. A little tobacco is placed in the pipe (*chillam*), then a layer of the prepared *ganja*, then more tobacco and above all the fire. Four or five persons usually join in the use of this. The *hookah* is passed round and each person takes single draught. Intoxication ensures almost instantly and within half an hour to the novice and after four or five inspirations to those that are accustomed to it. The effects differ from those occasioned by *siddhi*. Heaviness, laziness and agreeable reveries ensue, but the person can be readily roused and made to discharge his routine duties. The intoxicating quality of the drug is said to increase with the length of the time spent on rubbing it, but this is doubtful. Though *ganja* is mainly used far smoking, a small quantity is used for taking internally in certain parts of India, *e.g.*, Puri of Madras Presidency. A sweet made by mixing *ganja* with seeds of black *dhatura* and sugar is used by criminals to drug people.

"*Bhang*" prepared from the dried larger leaves which are collected separately, is pounded in water to a pulp and used in the preparation of a drink. The resin itself, to which the intoxicating properties of the drug are due, is known as "*churras*" or "*charas*" and is obtained by kneading *ganja* with the hands, or by causing men, clothed in leather garments to brush through the living plants as violently as possible, with the result that the resin escapes from the wounded surfaces of the plants and adheres to the leather, from which it is afterwards scraped and rolled into balls.

The *Majoom* or hemp confection made in ghee and with the addition of water contains *bhang, ganja, charas,* opium, poppy-seeds, *dhatura* leaves and seeds, cloves, mastich, aniseeds, cumin, sugar, butter, flour, milk, cardamoms and *tabashir. Dose*: ½ to 1 drachm. One drachm by weight will intoxicate a beginner; three drachms will be required to one that is accustomed to its use. The taste is sweet and odour very agreeable. Sometimes, if the customers require, stramoniun seeds are introduced, *but never nux vomica.* It is most fascinating in its effects, producing ecstatic happiness, a feeling of high rank, a sensation of flying. voracious appetite and intense aphrodisiac desire.

Paste consists of equal parts of *Bhang, Ganja* and pepper made into a paste with water.

Uses

Bhang and *Ganja* are prescribed by Hakims and Vaidyas in bowel complaints and recommended as appetisers, as nervous stimulants and as a source of great staying-power under severe exertion or fatigue. *Leaves* make a good snuff for deterging the brain; their *juice* applied to the head removes dandruff and vermin; dropped into the ear it allays pain and destroys worms; it checks the discharge in diarrhoea and gonorrhoea. *Powder of the leaves* applied to fresh wounds promotes granulation; a *poultice* of the plant is applied to local inflammations, erysipelas, neuralgia, haemorrhoids, etc., as an anodyne or sedative. The dose of the leaves is 40 grains internally. Externally, a poultice of the fresh bruised leaves is useful in affections of the eye with photophobia; also applied to relieve pain and swelling in orchitis. The concentrated *resin* exudate (resinous matters) extracted from the leaves and flowering tops or agglutinated spikes of *C. sativa*, and known as *nasha* or *charas* which form the active principle when collected separately, is used to produce sleep in cases of sleeplessness, in which opium is contraindicated; it is valuable in preventing and curing sick-headaches, neuralgias, migraine (malarial and periodical), valuable in acute mania, whooping cough, asthma, dysuria and in relieving pain in dysmenorrhoea and menorrhagia and pain of the last stages of phthisis; it increases appetite. It does not produce loss of appetite or constipation like opium. For asthma and tetanus the dose of the extract is from ¼ to 2 grains; the leaves powdered mixed with sugar and well fried in ghee and with black pepper added are administered in chronic diarrhoea; with poppy seeds the extract is given in dysentery; with asafoetida it is given in hysteria. In cases of chronic colic wonderful effect is produced

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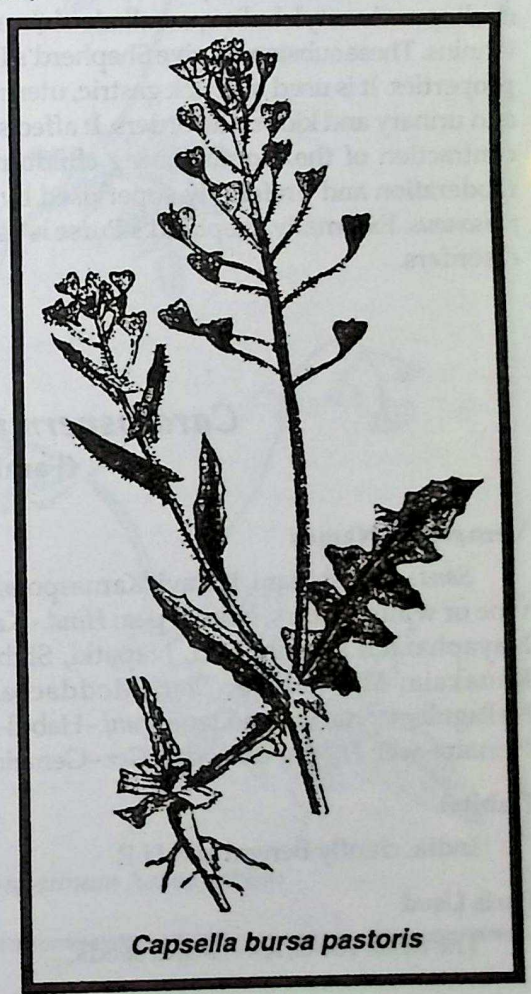
by the administration of 1 grain of the extract in combination with ¼ grain of ipecacuanha. In dysentery about half a drachm of dried tender leaves mixed with a little sugar and black pepper powder is a well-known and successful remedy; the *tincture* of the British Pharmacopoea is also used in 15 to 20 minim doses three times a day especially in acute dysentery; combined with belladonna it is given in whooping cough, infantile convulsions, hepatic and renal colic, tetanus and hydrophobia. *Oil* extracted from the seeds is used for rubbing in rheumatism. *Paste* applied to the head relieves dandruff and vermin.

Numerous confections of *bhang* are described in books. They are as their names imply, considered aphrodisiac and are used in chronic bowel complaints and nervous debility. Most of them are prepared with equal parts of a number supposed tonic and aphrodisiac substances in small quantities and *bhang* equal in weight to all the other ingredients together with sugar, honey and the usual aromatics. *Majoom* would be a neater substitute for these complicated preparations.

Capsella bursa pastoris, Moench.

(Family: Cruciferae)



Capsella bursa pastoris

Vernacular Name

Eng.–Shepherd's Purse.

Botanical Description

An annual or biennial herb with entire or pinnately lobed basal leaves arranged in a rosette; the small, lanceolate stem leaves are clasping and sagittate at the base. The inconspicuous small white flowers are arranged in terminal racemes. The fruit is a triangular-obcordate silicula and it is this that gave the plant its name as it looks like an old-fashioned leather purse. The generic name, *Capsella*, bas a similar meaning.

Habitat

Occurs in South India. Shepherd's Purse is a persistent and common weed of waste ground, fields and gardens throughout the world, including the British Isles. It was traditionally used to check haemorrhage in childbirth and bleeding from open wounds. In many countries the leaves are eaten as a vegetable.

Constituents

A new flavonoid–luteolin-7-rutinoside, m.p. 184°–and quercetin-3-rutinoside from bark; luteolin-7-galactoside, m.p. 228°, from bark.

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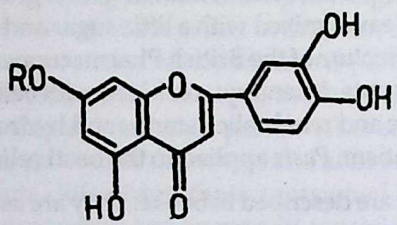
New Compounds



Luteolin-7-galactoside
R = Gal
Luteolin-7-rutinoside
R = Rutin

Uses

The flowering stems are used medicinally. They should always be free of a parasitic fungus, *Cystopus candidus*, which produces a white coating on the plant. The constituents include the amines choline and acetylcholine, an alkaloid (bursine), a flavonoid glycoside (diosmin), organic acids and tannins. These substances give Shepherd's Purse astringent, haemostatic, vasoconstricting and diuretic properties. It is used to check gastric, uterine and pulmonary bleeding, to treat gastritis and enteritis, and urinary and kidney disorders. It affects the smooth muscles in the uterus and it is thought to assist contraction of the womb during childbirth. Any internal use of Shepherd's Purse should be in moderation and preferably supervised by a qualified medical or herbal practitioner; *large doses are poisonous*. Externally Shepherd's Purse is used in compresses to bathe wounds, eczema and other skin disorders.

Cardiospermum halicacabum, Linn.
(Family: Sapindaceae)

Vernacular Names

Sans.–Jyotishmani, Karavi, Karnaspota, Paravata-padi, Lata-phatki, Banu-Uchchhe; *Eng.*–Balloon vine or winter cherry, heart's pea; *Hind.*–Kanphata, *Mah.*–Kanphuti, Shibjal, Kakumardanika; *Ben.*–Nayaphataki, Lataphatkiri, Napatki, Shib-jhul; *Bom.*–Bodha; *Guj.*–Karodio, *Duk.*–Shibjub; *Can.*–Kanakaia; *Mal.*–Ulinja; *Tam.*–Moddacoatan, Mooda-cottan, Mudakithan; *Tel.*–Buddakakara, Nellagulisetenda, Vekkuditege; *Punj.*–Habul-kalkal (seed); *Burm.*–Malmai, Ma-la-mi; *Arab.*–Laftaf; *Sinh.*–Painaira-wel; *Fr.*–Poi-de-coeur; *Ger.*–Gemeiner herzsamen.

Habitat

India, chiefly Bengal and U.P.

Parts Used

The herb: roots, leaves and seeds.

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Constituents

Seeds or fruits yield a kind of essential oil, bitter and stimulant, and Saponin.

Action

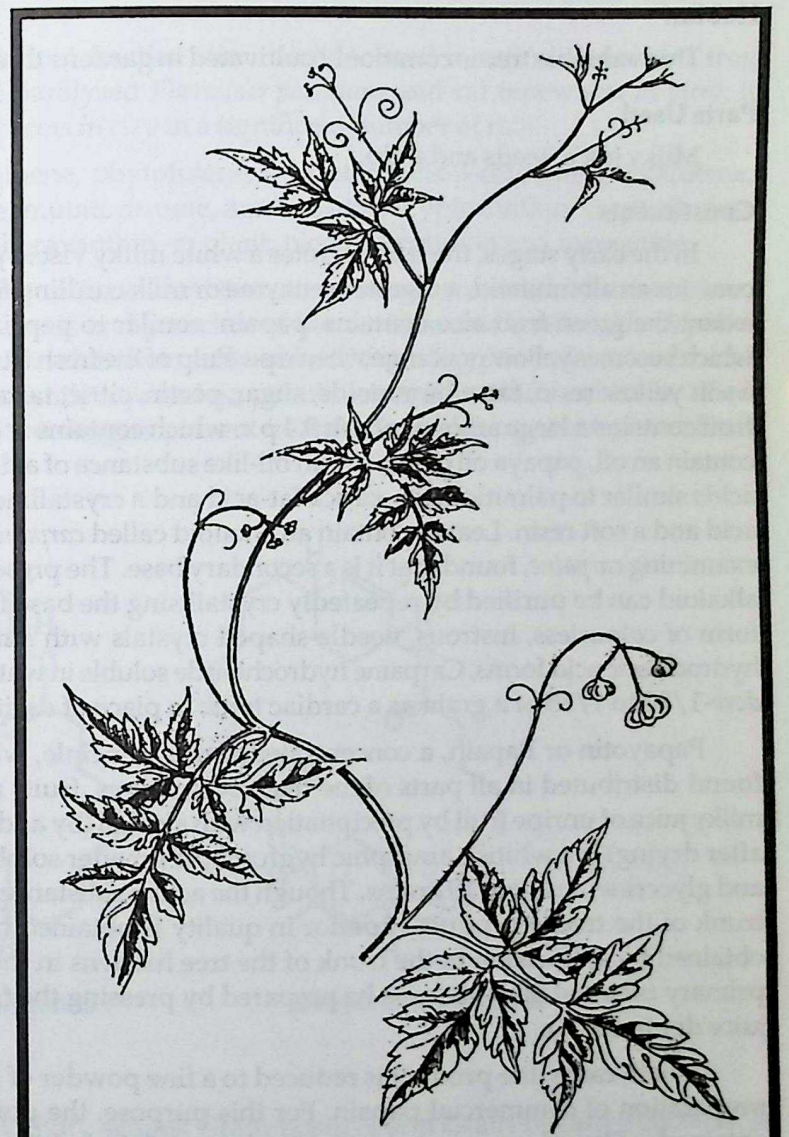
Root and the leaves are diuretic, laxative, stomachic, alterative and emetic; externally rubefacient.

Preparation

Decoction of the root (1 in 10), *dose*–4 to 10 drachms. A compound powder made up of Carbonate of potash, root of Acorns calamus, root-bark of *Terminalia belerica* and the leaves of this plant, all in equal parts; dose is 1 drachm.

Uses

Root and the *leaves* of the herb in decoction are used in rheumatism, nervous diseases, piles, chronic, bronchitis and phthisis. Dr. U.C. Dutt recommended the following preparation as an emmenagogue: Equal parts of leaves of *C. halicacabum*, potassium carbonate, root of Acorus calamus and root-bark of Terminalia tomentosa, are applied into a paste with milk; also in amenorrhoea one drachm doses of the same compound powder is given for 3 days, effects a free menstrual flow in about 3 days. Leaves fried are applied to the pubes to increase the menstrual flow in amenorrhoea. Leaves boiled in oil such as castor oil are applied over rheumatic pains, swelling and tumours of various kinds. *Juice* of the plant is dropped into the ear in earache and discharge from the meatus. Decoction of the root in doses of 4 to 6 ounces is considered as a diuretic, diaphoretic and laxative, and is given in half-ounce doses in cases of piles and amenorrhoea. The drug is used in snake-bite also. In short, the whole plant has also been used both internally and externally in rheumatism and lumbago.



Cardiospermum halicacabum

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Carica papaya, Linn.

(Family: Caricaceae)

Vernacular Names

Eng.–Papaw or Papaya tree; *Hind.*–Popaiyah, Arandkharbuza, Papita; *Pers. & Arab.*–Amba-hindi; *Punj.*–Arand-kharpuza; *Ben.*–Papeya, Panpe; *Guj.*–Papai, Paputa; *Mah.*–Popai; *Tel.*–Bappayi, Bobbasi; *Tam.*–Poppayi, Pappali, Parangi; *Mal.*–Kappalam, Pappayam; *Can.*–Pappangaye, Peragi, Piranji; *Kon.*–Poppaye-phal; *Sind.*–Paputa, Katha chibudo; *Fr.*–Papayer Commun; *Ger.*–Melonenbaum.

Habitat

This valuable tree is commonly cultivated in gardens throughout India; indigenous in America.

Parts Used

Milky juice, seeds and pulp.

Constituents

In the early stages, the fruit secretes a white milky viscid juice of the consistency of cream which contains an albuminoid, a digestive enzyme or milk curdling ferment-*papain* or *papayotin*. To a certain extent the green fruit also contains 'papain' similar to pepsin. A milky juice comes from the rind, which becomes yellow or orange when ripe. Pulp of the fresh fruit contains a caoutchouc-like substance, a soft yellow resin, fat, albuminoids, sugar, pectin, citric, tartaric and malic acids, dextrin etc. Dried fruit contains a large amount of ash 3.4 p.c. which contains soda, potash and phosphoric acid. Seeds contain an oil, papaya oil or caricin, an oil-like substance of a disagreeable taste and smell and several acids similar to palmitic acids, carica fat-acid and a crystalline acid called papayic acid, also a resin-acid and a soft resin. Leaves contain an alkaloid called *carpaine* and a glucoside named *carposide*. On examining *carpaine*, found that it is a secondary base. The present accepted formula is $C_{14}H_{25}O_2N$. The alkaloid can be purified by repeatedly crystallising the base from dilute spirit when it occurs in the form of colourless, lustrous, needle-shaped crystals with a melting point of 121°C. Carpaine with hydrochloric acid forms, Carpaine hydrochloride soluble in water, used hypodermically as an injection; *dose*-1/30 to 1/15 of a grain as a cardiac tonic in place of digitalis.

Papayotin or Papain, a concentrated active principle, which is the proteolytic enzyme, is also found distributed in all parts of the tree-roots, leaves, fruits and seeds; it is also obtained from the milky juice of unripe fruit by precipitation with alcohol (by adding alcohol and powdering the residue after drying) is a whitish amorphic hygroscopic powder soluble in 75 p.c. of absolute alcohol, water and glycerine; *dose*-2 to 10 grains. Though the active substance is obtained by an incision made on the trunk of the tree, a product superior in quality is obtained by pricking the fruits. The milky juice obtained by an incision in the trunk of the tree hardens in the air and forms crude papain. A good primary material may likewise be prepared by pressing the fruits with a little water and letting the juice dry in the air.

In both cases, the product is reduced to a fine powder of whitish appearance and serves for the preparation of commercial papain. For this purpose, the powder is dissolved in water, the liquid obtained is filtered, and treated with 10 volumes of alcohol. The product, thus purified, is finally dried at low temperature and is then pulverized. A papain of careful preparation can dissolve in 12 hours almost 2000 times its weight of fibrin. However, we rarely find products capable of such activity.

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Estimating the Proteoclastic Powder of Enzymes-(a) Pepsin. Pharmacopoeial method-The egg albumin employed for the test is made by boiling fresh eggs for 15 minutes, cooling, separating the whites from the yolks and membrane, and after drying the former with a cloth, and sieving it through a wire gauge containing 12 meshes to the centimetre. If 12.5 gm. of this albumin be suspended in 125 c.c. of acidified water prepared by mixing 1 gm. of hydrochloric acid of sp. gr. 1.160 with 156 c.c. water (0.2% HCl) and 5m. gm. be added to the mixture and the whole be incubated for 6 hours, with frequent shaking, at 40.5° the protein should dissolve, with the exception of a few flakes, to a clear solution. Relative strength of different preparations can be approximately ascertained by estimating how much more or how much less, than 5m. gm. can produce the same result.

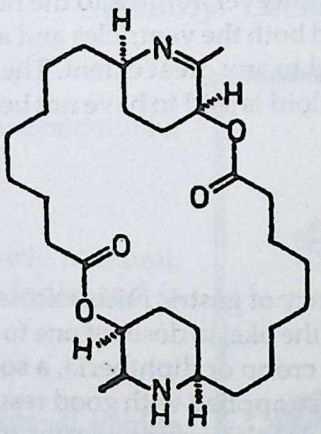
Constituents

Alcoholic extract of seeds and alkaloid fraction stimulated isolated intestine, depressed frog heart and blood pressure. The extract paralysed *Pheretima posthuma* and rat tapeworm *in vitro*; it reduced ova count and expelled tapeworms *in vivo* in a significant number of rats.

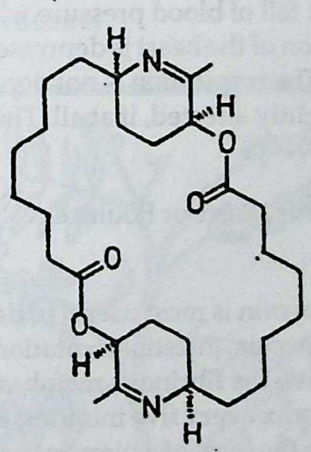
Identification of carotenoids–phytoene, phytofulene, β-carotene, cis-β-carotene, (–) carotene, pigment X, 5,6-monoepoxy-β-carotene, mutatochrome, auxochrome, cryptoxanthin, cryptoflavine, violaxanthin, cis-violaxanthin and antheraxanthin–in plant; nicotine, cotinine and myosmine.

Dehydrocarpaines I and II isolated from leaves and their structures determined; hentriacontane, β-sitosterol and glucose isolated from seeds and presence of benzoylthiourea confirmed; carpaine isolated; myristic, palmitic, stearic, oleic and linoleic acids isolated from Egyptian plant; lauric acid isolated from leaves, flowers and fruits, while myristoleic, palmitoleic and arachidic acids identified in flowers and fruits only; pectin and free sugars present in fruits; pseudocarpaine isolated from leaves.

New Compounds



Dehydrocarpaines I



Dehydrocarpaines II

Biological Activity

Carpaine showed anti-microbial activity against Gram-positive and Gram-negative bacteria. It was found to be highly active against *Bacillus cereus* and moderately active against *B. mycoides*.

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Action

A good sample of Papayotin and papain, according to British Pharmacopeia Codex, resembles pepsin in its physiological properties and is capable of digesting 200 to 250 times its weight of fresh, pressed blood-fibrin in 4 to 5 hours at the temperature of 45/50°. Its action is quicker than and superior to that of ordinary animal pepsin at a higher temperature and has the peculiar additional advantage of requiring neither the aid of a free acid nor an alkali to convert the contents of the stomach into peptones, 7 grains of papayotin can digest a pint of milk. Papain dissolves natural, albuminoid material such as muscles, diphtheretic false membrances, cancerous tissues and their like. Papain decomposes peptone much more rapidly than does pepsin. The hydrolysis is also more thorough promptly producing tryptophane, and in operations of long duration, tyrosin. However, tyrosin is not produced in papainic digestions with some facility as in tryptic digestions. Sap of Carica papaya contains a constituent which is a powerful digestive of albuminoid substances and meat-albumen forming true peptones and like pepsin curdles milk. It has the extraordinary energetic action of hastening the decay of muscular fibre and nitrogenous substances exposed to its influence. Juice of the green fruit is emmenagogue and in large doses it acts as ecbolic. Fresh milky juice is rubefacient. As a solvent of fibrin and other nitrogenous substances the juice makes the meat tender. 'Makhzan-el-adwiya' mentions the use of the juice mixed with fresh ginger, for making meat tender. The milky juice of the unripe fruit is said to possess powerful anthelmintic properties. Women in South India believe that the seeds are powerfully emmenagogue. Leaves are saponaceous. Filtered juice, unlike pepsin, gives no precipitate on boiling but is precipitated by mercury chloride, iodine and all the mineral acids; like pepsin it is precipitated by neutral acetate of lead and does not give any precipitate with copper sulphate and iron chloride. The active principle so separated from the fruit is named papain (vegetable pepsin) or papayotin. Ripe fruit is digestive and alterative; green fruit is laxative and diuretic. Carpaine is said to be not very toxic. A dose of 5 mgm., when injected intravenously in experimental animals, causes only a slight fall of blood pressure which, however, returns to the normal level within a very short time. The action of the heart is depressed and both the ventricles and auricles show evidence of slight depression. The respiration is not depressed to any great extent. The volumes of the different organs are very slightly affected, if at all. The alkaloid is said to have not been used in therapeutics.

Preparation

Juice, Pulp, Syrup, Paste or Poultice.

Uses

Papain or papayotin is most useful in deficiency of gastric juice, excess of unhealthy mucous in the stomach, in dyspepsia, intestinal irritation and the like, to doses of one to five grains; it is also used in solution to dissolve the fibrinous membrane in croup or diphtheria, a solution in glycerine being painted on the pharynx every five minutes; and also applied with good results to ulcers and fissures of the tongue and, in the form of a pigment prepared with borax and water, to remove warts and corns and water horny excrescences of the skin; in psoriasis and chronic eczema especially of the palms of the hands-Papain 12 grains, powdered borax 5 grains, and distilled water 2 drachms. Mix, and make a solution. Apply it to the part effected.

Milky juice of unripe fruit mixed with honey and followed by castor oil acts as an anthelmintic for round worms. The milky juice, which is more efficacious in dissolving albumn than pepsin, is gathered from incisions made on the unripe fruit scraped longitudinally and the juice is put on a sand bath; it should be dried at a low temperature; after 24 hours or so a dull white powder is left; this is the best preparation for internal use; one or two grains with sugar or milk after meals should be given to

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adults. A preparation of this kind is sold under the name of "Finkler's Papain." The milky juice is exported from Ceylon and other places to Europe for the manufacture of vegetable pepsin which is given to invalids with weak digestion. The tincture does not keep well and is disagreeable to taste; *syrup* of the powder may be made, if required, for children and women. It is most efficacious in dyspepsia. Fruit is useful in chronic diarrhoea. Juice of the green fruit if applied locally in the shape of pessary to the osuteri induces abortion; it dissolves coagulated albumen. Fresh milky juice is an application for ringworm; it is a certain remedy in cases of scorpion stings; seeds are also similarly useful; they and the milky juice form the best vermifuge especially for round worms in children. Juice of the pulp of the ripe fruit removes freckles. Dark-coloured seeds taste like water-cress. Ripe fruit if eaten regularly corrects habitual constipation; it is useful in piles (bleeding piles) and dyspepsia. Boiled and mixed with lime-juice and sugar it makes a good sauce. Dried and salted fruit reduces enlarged spleen and liver. Unripe and green fruits are made into curry and eaten by women to stimulate secretion of milk. Leaves dipped in hot water or warmed over a fire are applied to painful parts for nervous pains. Bruised *leaves* applied as a *poultice* are said to reduce elephantoid growths; inspissated juice of the fruit in pill form, in doses of 2 to 4 grs., is given internally for the same disease. Papaya resembles the apple in taste and is substituted for the sauce of the latter fruit. It has the property of making meat, hung on the branches or the tree, tender; the green fruit is also mixed with meat when set to boil, for the same purpose, and also cut into slices and eaten as vegetable; it is also pickled. Some eat the fruits with ginger or with sugar and lemon juice, or pepper and salt.

Cassia angustifolia, Vahl.
(Family: Caesalpiniaceae)

Vernacular Names

Hind.–Hindisana; *Ben.*–Sonamukhi; *Tam.*–Nila vakai.

Habitat

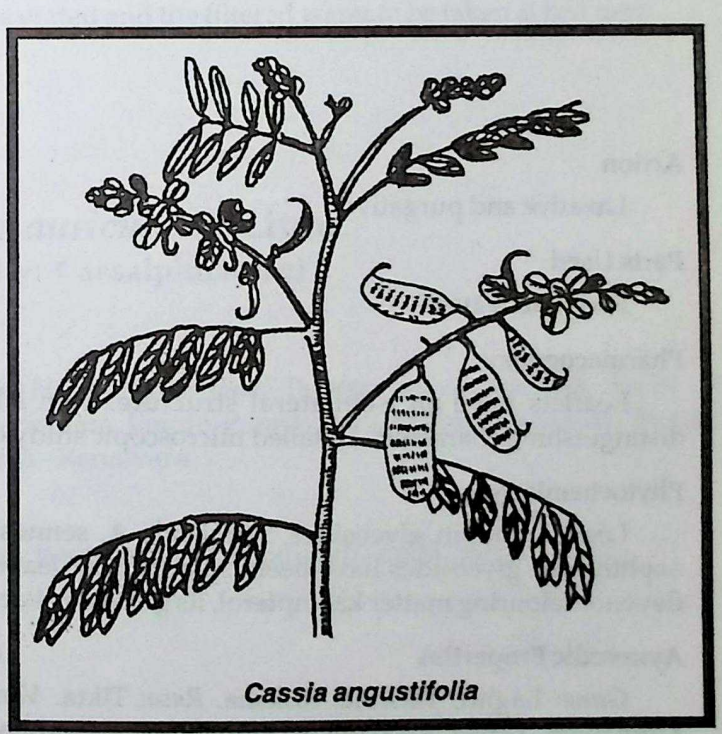
It is grown in Tirunelvelly, Madurai, Tiruchirapalli, in South India and is extensively cultivated.

Historical Aspects

The Sanskrit name *Markandi*, implies the association of the plant with the ancient sage *Markandeya*. The plant had a medicinal value as a cathartic in the Middle East and Europe. However, the other uses as described in ayurveda were uncommon.

Botanical Description

A small shrub, about 1 m in height with pale subterete or obtusely angled



Cassia angustifolia

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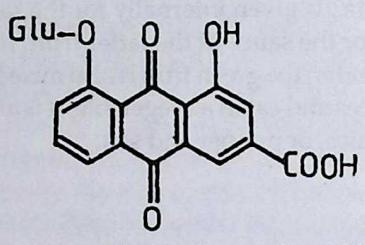
erect or ascending branches. *Leaves* usually 5-8 jugate, leaflets oval, lanceolate, glabrous. *Racemes* axillary erect, waxy many-flowered, usually considerably exceeding the subtending leaf. Bracts membranous, ovate or obovate, caducous. Sepals obtuse, cuneate compressed, cotyledons plane. The *pods* are 1.4 to 2.8 in long, about 0.8 in wide, greenish brown to dark brown in colour and contain 5-7 obovate dark brown and nearly smooth *seeds*.

Constituents

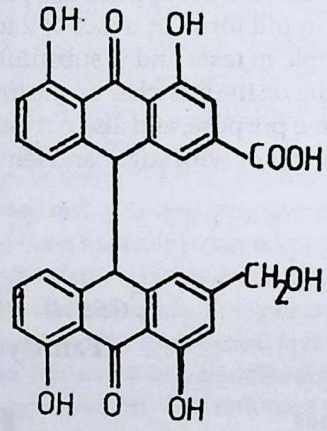
Glucoside, Kampferin, anthraquinone, essential oil, chrysophanic acid, iso-rhamnetin; Ca-oxalate 12% in leaves.

New glycoside from leaves and pods yielded aglycone–sennidin; gluco-aloeemodin; rhein-8-monoglucoside and another glucoside, m.p. 183°.

New Compounds



Rhein-8-monoglucoside



Sennidin

Action

Laxative and purgative.

Parts Used

Pods and leaves.

Pharmacognosy

Leaflets have an isobilateral structure. Vein islet numbers and stomatal indices are the distinguishing characters. Detailed microscopic study of the leaflet is carried out.

Phytochemistry

Leaves contain glycosides, sennoside A, sennoside B, sennoside C and sennoside D. Two naphthalene glycosides have been isolated from leaves and pods. Senna also contains the yellow flavonol colouring matter kaempferol, its glucoside kaempferin and isorhamnetin.

Ayurvedic Properties

Guna: Laghu, Tikshna, Ruksha. *Rasa*: Tikta. *Veerya*: Ushna. *Vipaka*: Katu. *Dosha*: Vatahara, Kaphahara. *Karma*: Rochana, Kushthaghna, Kasaghna, Durgandhyanashana.

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Pharmacology

Maximum cathartic action was seen in rats with 80 mg/kg in eight hours–due to direct stimulant activity and water and electrolyte secretion. Senna extract introduced into the lumen of the bowel through colostomy had no effect on the motility, though the same extract introduced with faeces or a culture of *Escheichia coli* stimulated peristalsis. Sublaxative doses of standardised senna fruit showed spasmolytic activity. Effective dose of piperazine for the treatment of threadworms and roundworms was substantially reduced by the addition of extract of senna. Water extract was found effective against *Trichophyton purpurceum*.

Safety

It is a safe laxative. It may cause griping for which the drug is to be used with ginger.

Clinical Usage

Leaves and pods are used traditionally as purgatives. Topical use of the leaves for dermatosis is also not uncommon. Laxative effect of standardised senna fruit granules was compared with liquid paraffin or a mixture of liquid paraffin and magnesium hydroxide in fifty nursing mothers. Senna was more effective than the control treatment in overcoming puerpural constipation while the bowel habits of infants were not affected.

Indications

1. Constipation
2. Dermatoses

Formulations and Dosage

1. Leaf powder: 3 gm at bed time.
2. Pods: 10-20 soaked in water, macerated and the filtered water to be taken at bed time.
3. Leaf paste: Topical use.

Cassia auriculata, Linn.

(Family: Caesalpiniaceae)

Vernacular Names

Eng.–Mature tea tree, Tanner's cassia; Hind., *Ben. & Duk.*–Tarwar; *Guj.*–Awal; *Mah.*–Taravada; *Tel.*–Tangedu; *Tam.*–Avarai, Avirae; *Mal.*–Aveeram, Jimute, Ponnaviram, Avara; *Can.*–Taravada-gida, Avrike Chakusina-gida; *Cutch.*–Awala; *Sinh.*–Rana-vara.

Habitat

It grows wild in the Central Provinces, Western Coast, South India and Ceylon.

Parts Used

Root, leaves, flowers, bark and seeds.

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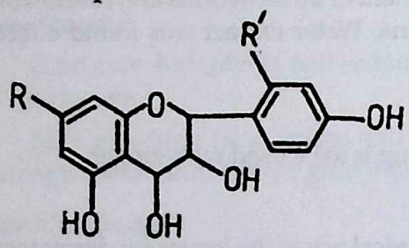
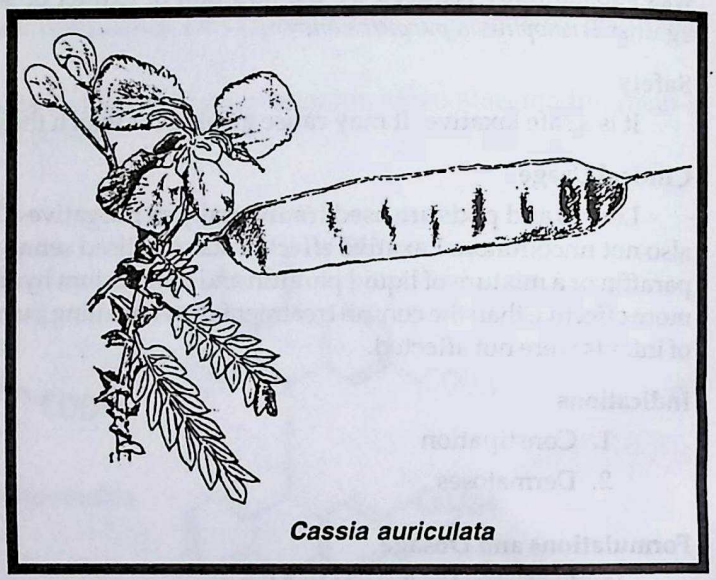
Constituents

Bark contains tannin 25 p.c. and ash 5 p.c. A new leucoanthocyanin–goratensidine –characterised as 4′, 5,7-trihydroxyflavan-3,4-diol (-)auriculacacidin characterised as 5,2′,4′-trihydroxyflavan-3,4-diol.

New Compounds



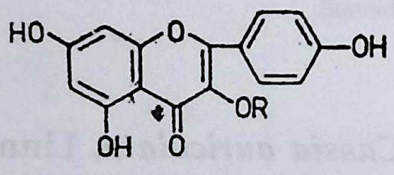
Goratensidine
R = OH, R' = H
Auriculacacidin
R = H, R' = OH



Cassia auriculata

A new glycoside–kaempferol-3-O-β-mannopyranosyl-(1→4)-O-β-D-glucopyranoside(I)–isolated from seeds; cinnamic acid and sucrose from fruits; aloe-emodin (0.008%) isolated from leaves.

New Compounds



I

R = Glu(4→1)Man

A new chalcone–3′,6′-dihydroxy-4-methoxychalcone (I)–isolated from root bark; octacosanol, hentriacontanol, ceryl alcohol, β-sitosterol and peonidin-3-O-α-L-rhamnopyranoside isolated from flowers; two new leucoanthocyanins–leucocyanidin-3-O-α-L-rhamnopyranoside and leucopeonidin-3-O-α-L-rhamnopyranoside–isolated from root bark; chrysophanol, physcion, 1,5-dihydroxy-4,7-dimethoxy-2-methylanthraquinone-3-O-α-L-rhamnopyranoside and 1,3,6,7,8-pentahydroxy-4-methoxy-2-methylanthraquinone from seeds; a galactomannan isolated from seeds; a new flavone glycoside–javanin–isolated and characterised.

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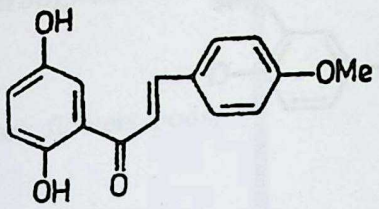
New Compounds



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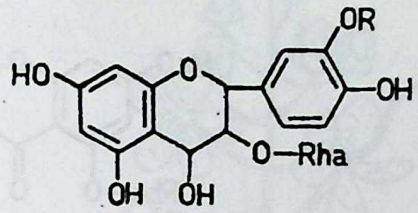
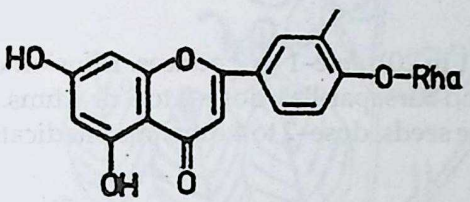


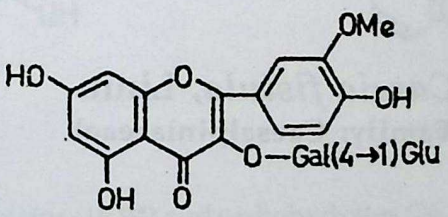
Leucocyanidin-3-O-rhamno
R = H
Leucopeonidin-3-O-rhamnoside
R = Me



Javanin

A new flavonol glycoside–cassiglucin–isolated from seeds and its structure determined; 1,3-dihydroxy-6,8-dimethoxy-2-methylanthraquinone along with two new glycosides–3-hydroxy-6,8-dimethoxy-2-methylanthraquinone-1-O-β-D-glucopyranoside and 3-hydroxy-6,8-dimethoxy-2-methylanthraquinone-1-O-rhamnosyl (1→6)glucopyranoside–isolated from seeds and their structures established; 1,3,8-trihydroxy-2-methylanthraquinone also isolated; 5-acetonyl-7-hydroxy-2-methylchromone, its C-glucoside and 5-acetonyl-7-β-D-glucopyranosyloxy-2-methylchromone isolated from leaves; 1,3-dihydroxy-2-methylanthraquinone, 1,3,8-trihydroxy-6-methoxy-2-methylanthraquinone, 1,8-dihydroxy-6-methoxy-2-methylanthra-quinone-3-O-rutinoside and 1,8-dihydroxy-2-methylanthraquinone-3-O-rutinoside isolated from roots.

New Compounds



Cassiglucin

A new flavone glycoside–velutin-5-O-α-L-rhamnopyranoside, m.p. 138°–isolated from seeds and its structure determined.

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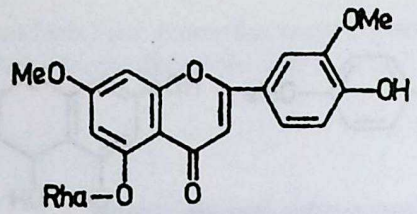
New Compounds



Velutin-5-O-α-L-rhamnopyranoside

Action

Seeds are refrigerant and attenuant; bark is astringent and tonic. Root in decoction is used as alternative.

Preparation

Infusion of leaves (1 in 20); *dose*–1 to 2 ounces. Infusion of bark-Compound syrup (of flowers, mixed with Mochatas and Sarsaparilla); dose–2 to 4 drachms. Decoction of root (1 in 20) dose–2 to 8 drachms; electuary of the seeds, dose–2 to 4 drachms; medicated baths of leaves.

Uses

Decorticated seeds in fine powder or paste are valued local applications to purulent ophthalmia or conjunctivitis known as country sore eye seeds with their testa and their kernels are finely powdered and blown into the eyes or the *powder* mixed with coconut or gingelly oil is .applied to the sore eyes. Seeds are also used in diabetes and chylous urine. The plant is used in the form of a powder mixed with honey or the *decoction*, especially of flower buds, is administered in chylous urine and diabetes with excellent results. *Twigs* are used as tooth-brushes. In the south of Ceylon, *leaves* are used as a substitute for tea. Coffee made from powdered seeds or leaves, is a good substitute for coffee made from seeds of Coffea arabica, and is usefully prescribed in giddiness due to heart disease. *Flowers* are used as pessaries by women in Gujarat to check excessive menstrual flow. *Infusion of bark* is used for enemas, gargles etc., as a substitute for tannic acid, or oak galls. *Compound syrup* is prescribed for nocturnal emissions.

Cassia fistula, Linn.
(Family: Caesalpiniaceae)

Vernacular Names

Sans.–Nripadruma Aragbhada, Arakvadam, Rajavraksha, Suvarnaka; *Eng.*–Indian Laburnum, Pudding Pipe tree, Purging Cassia; *Hind.*–Sonhali, Amulthus; *Gwalior & Duk.*–Amaltas, Girmalah, Kirvali; *Ben.*–Bundarlati, Sonalu, Soondali, Sondal; *Guj.*–Garmala; *Mah.*–Bahava; *Tel.*–Kondrakayi, Raelachettu, Aragvadhamu, Koelapenna, Relagujju; *Tam.*–Konai, Irjviruttam, Konraikkai, Sarakkonnai or Sarokkonnoi; *Mal.*–Konna; *Can.*–Kakkaemara; *Kon.*–Kakkayi; *Sinh.*–Ahalla; *Arab.*–Khayar-shambar.

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Habitat

Common throughout India and Burma.

Parts Used

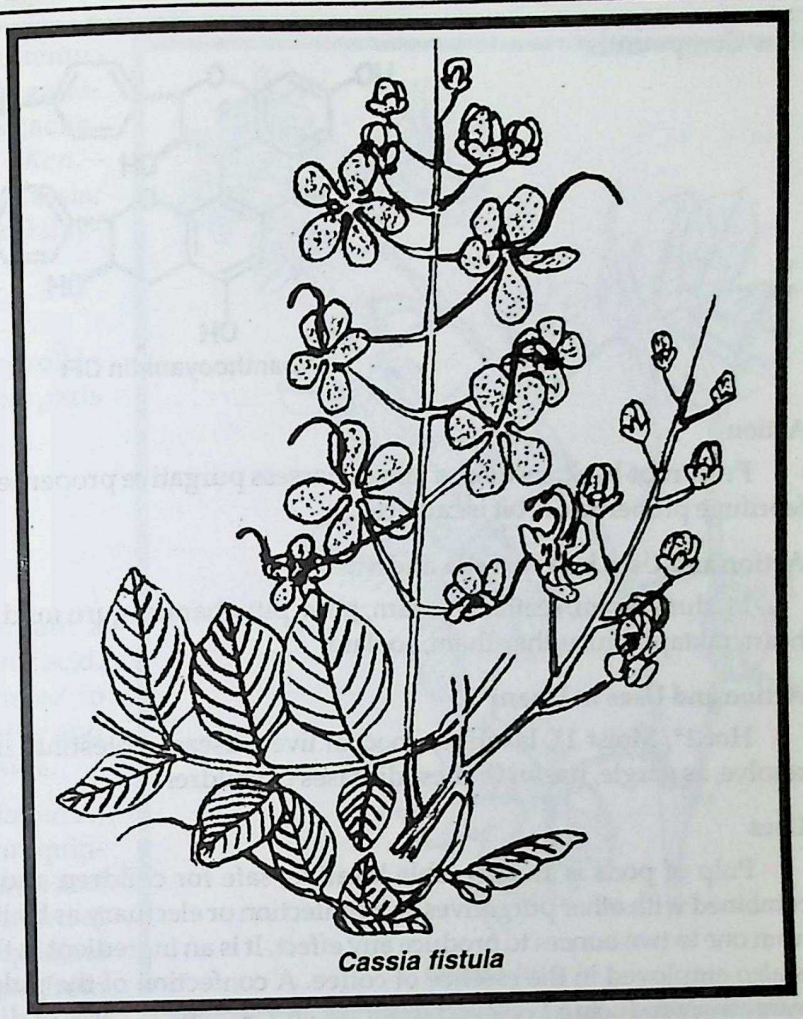
Pulp, root–bark, flowers, pods, leaves and root.

Constituents

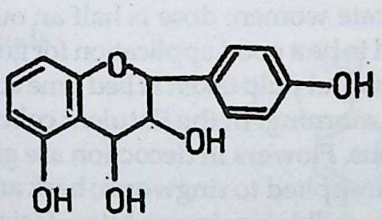
By steam-distilling the finely powdered fruit, a dark-yellow volatile oil with honey-like odour is obtained. Water which distils over with the oil contains normal butyric acid. Pulp consists of sugar, gum, astringent matter, gluten, colouring matter and water.

Fistucacidin, mp. 245° from bark identified as racemic or meso 3,4,4′,7,8-pentahydroxyflavan; glucoside from pod identified as rhein glucoside; lupeol, β-sitosterol and hexacosanol; leucoanthocyanidin–5,4′-dihydroxyflavan-3,4-diol (I)– from sapwood.

New Compounds



Cassia fistula



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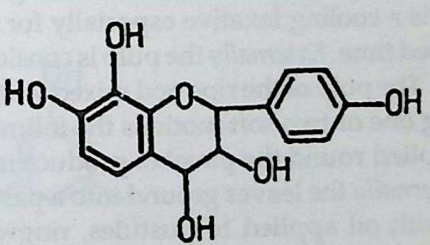

Fistucacidin

Fruit pulp contained proteins (19.94) and carbohydrates (26.30%); arginine, leucine, methionine, phenylalanine, tryptophan, aspartic and glutamic acids isolated from fruit pulp; a new dimeric proanthocyanidin CFI isolated along with (-)epiafzelechin, (+)catechin, kaempferol, dihydrokaempferol and 1,8-dihydroxy-3-methylanthraquinone; its structure determined.

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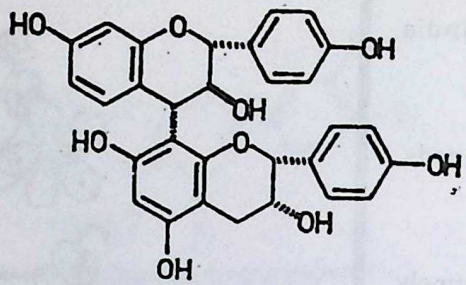
New Compounds



Proanthocyanidin CFI

Action

Pulp, root-bark, seeds and leaves possess purgative properties. Root acts as purgative, tonic and febrifuge properties. Fruit is cathartic.

Action and Uses in Ayurveda and Siddha

Madura rasam, seetha veeryam, pitta, pitta-haram, guru mild laxative, in jwaram, diseases of the heart, raktapittam, udhardham, soolam.

Action and Uses in Unani

Hot 1°, Moist 1°, laxative, good in liver disease, intestinal ulceration, externally as a paste to resolve, as gargle, useful in chest diseases of children.

Uses

Pulp of pods is an agreeable laxative, safe for children and pregnant women. It is best used combined with other purgatives as a confection or electuary as by itself it requires to be taken in doses from one to two ounces to produce any effect. It is an ingredient in the confection of senna. Cassia pulp is also employed in the essence of coffee. A confection of the pulp in 2 to 4 drachm doses is a mild purgative producing 1 or 2 soft motions; and is given in cases of diabetes. *Gulkhand* of which it forms an ingredient is a cooling laxative especially for delicate women; dose is half an ounce with warm milk taken at bed time. *Externally* the pulp is considered to be a good application for gout, rheumatism, snake-bite, etc. The pulp of the ripe pod mixed with tamarind pulp taken at bed time acts on the bowels mildly causing one or two soft motions the following morning. In the flatulent colic of children it is commonly applied round the pavel to produce motions. Flowers in decoction are given in stomach affections. *Externally* the leaves ground into a paste are applied to ringworm; bark and leaves mixed and rubbed with oil applied to pustules, ringworm, chilblains, insect bites, facial paralysis and rheumatism. From 5 to 7 of the powdered seeds are prescribed as an emetic. Root is useful in fever, heart-diseases retained excretions, biliousness etc.

Cassia tora

(Family: Caesalpiniaceae)

Vernacular Names

Sans.–Dadamardana, Kharjugna, Taga, Ayudham, Prabhoonata, Chakramarda (destroyer of ringworm); *Hind. & Ben.*–Chakunda, Panevar; Gwalior.–Pambar; *Duk.*–Tarota; *Bom. & Guj.*–Kovaraya;

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Mah.–Tankala; *Tel.*–Tagirisa, Tantemu, Tantiyamu; *Tam.*–Ushittagarai, Thagarai-verai (seeds), Tagarai, *Cn.*–Tagache, Taragashee; *Mal.*–Takara; *Kon.*–Daddupan; *Eng.*–Foetid Cassia, Cassia; *Arab.*–Kulikul, Sanji; *Burm.*–Dan-kilay-iwai; *Sinh.*–Tora.

Habitat

A small plant growing on dry soil in Bengal and throughout the tropical parts of India.

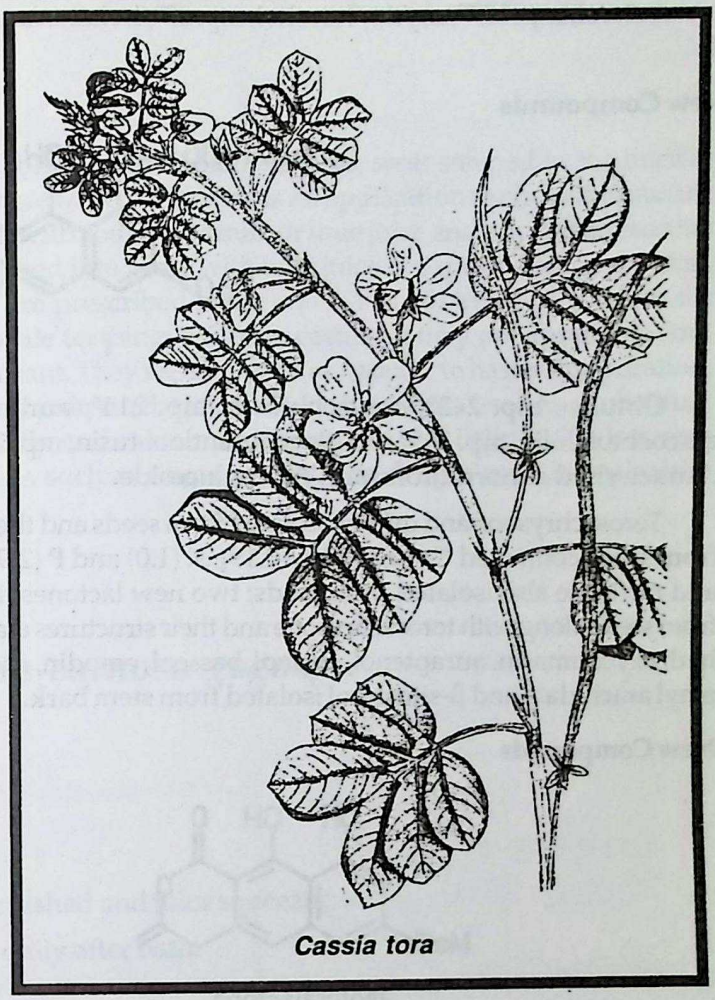
Parts Used

Leaves, seeds and roots.

Constituents

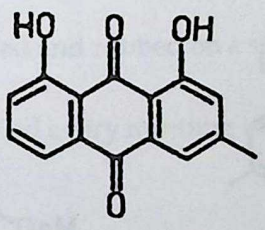
Both leaves and seeds contain a glucoside resembling chrysophanic acid. Leaves contain a principle similar to cathartin and a red colouring matter and mineral matters. "Emodin glucoside.

Lupeol, chrysophanol, cassiamin A, mp. 356°, from root bark; dianthraquinone pigments–cassianin, siameanin and siameadin– and several neutral compounds from trunk bark; lupenone from trunk bark; tetrahydrostilbene from heartwood.

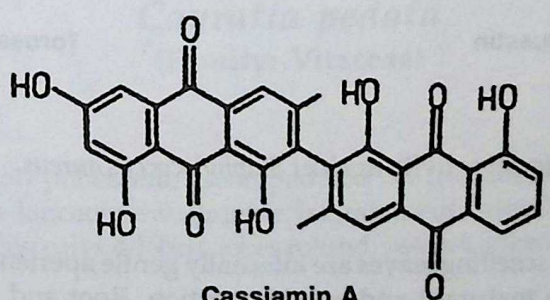


Cassia tora

New Compounds



Chrysophanol



Cassiamin A

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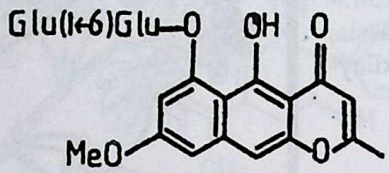
A sterol, mp. 137°, myricyl alcohol, mp. 87°; isolation and structure of a new rubrofusarin glycoside (I).

New Compounds

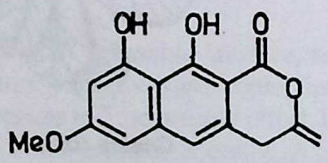


I

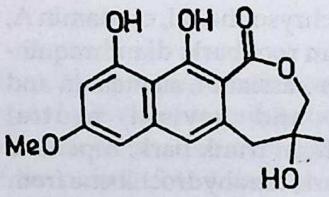
Obtusin, mp. 242°, chrysoobtusin, mp. 214°, aurantioobtusin, mp. 265°, from seeds; new glucoobtusifolin, mp. 205° and glucoaurantioobtusin, mp. 243°; new glucoside–cassiaside, mp. 256°–characterised as norrubrofusarin-6β-D-glucoside.

Torosachrysone and questin isolated from seeds and their structure determined; total ash (10.38%) from seeds contained Ca (0.35), Na (0.19), K (1.0) and P (2.9%); oil (10.5%), glucose, galactose, xylose and raffinose also isolated from seeds; two new lactones–isotoralactone and cassialactone–isolated from seeds along with torosachrysone and their structures elaborated; 3,5,8,3′,4′,5-hexahydroxyflavone, hydroxycoumarin, auraptenol, euphol, basseol, emodin, rhein, palmitic, isostearic and behenic acids, ethyl arachidate and β-sitosterol isolated from stem bark.

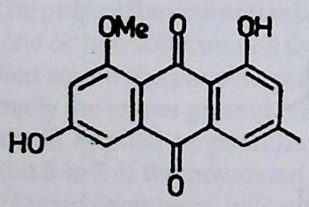
New Compounds



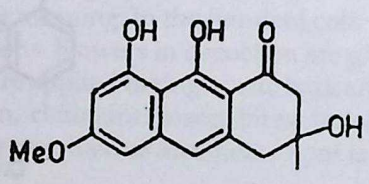
Isotoralactone



Cassialactone



Questin



Torosachrysone

Biological Activity

Questin showed antibacterial activity against *Staphylococcus aureus.*

Action

Nucilaginous and foetid smelling leaves are internally gentle aperient, externally germicide and antiparasitic; they have also maturant and anodyne action. Root and seeds also have the same properties, externally.

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Preparation

Decoction, Paste, Poultice and oil.

Uses

Both *leaves* and *seeds* constitute a valuable remedy in skin diseases; *seeds* steeped in the juice of Euphorbia nerifolia and then made into a *paste* with cow's urine is an application to cheloid tumours; also useful in leprosy, psoriasis, etc., ground with sour buttermilk or lime juice and applied to ease the irritation of itch or skin eruptions. Root rubbed into paste with lime juice is a specific for ringworm, applied also for buboes in plague. *Leaves* are prescribed *in decoction* (1 in 10) in 2-ounce doses for children suffering from feverish attacks while teething; boiled in castor oil they are applied to foul ulcers; also inflammations caused by any irritant. They are also, used as a *poultic* to hasten suppuration. It forms a warm remedy in gout, sciatica and pains in the joints. Seeds have been used as a substitute for coffee and tea. An oil called *Chakre-mardha* and containing Cassia tora and Eclipta alba is a very useful application in obdurate skin diseases such as ringworm etc. The drug is used in snake-bite also.

Cayratia carnosa gagnep

Vernacular Names

Mah.–Aambatvel; *Hind.*–Amal-vel

Illness	:	**Ringworm**
Part used	:	Leaves
Preparation	:	A handful of leaves crushed and juice squeezed out.
Dosage	:	Apply the juice once daily after bath.
Illness	:	**Wounds**
Part used	:	Tuberous root
Preparation	:	The bulb is washed and rubbed on a stone to obtain a paste which is prepared a fresh every day.
Dosage	:	The paste is applied every morning till the wound has healed.

Cayratia pedata

(Family: Vitaceae)

Botanical Description

Liane; branchlets densely pubescent; leaves pedately 5-7 foliolate, leaflets 7-12 × 3-6 cm, terminal one elliptic-oblong or ovate-lanceolate acuminate, laterals inequilateral, pubescent; flowers greenish in axillary corymbose panicles; calyx 4-lobed, lobes rotund; petals 4, green, ovate; disc 4-lobed, crenulate

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at the rim; stamens 4; ovary 2-celled, ovules 2-per cell; berry depressed globose, 2-4 seeded.

Habitat

Common in western Peninsular India, in waste lands and scrub jungles. Also reported from Sri Lanka and Malaya.

This is used as an ingredient of *Ayaskrti* of the Kerala physicians. But there is little mention about this drug in ancient Ayurvedic texts. It is reported that the leaves are astringent and refrigerant and are used to cure ulcers. Decoction of leaves checks uterine and other fluxes. The whole plant is acrid, refrigerant, costive and beneficial in hysteria, burning of the skin and diarrhoea.

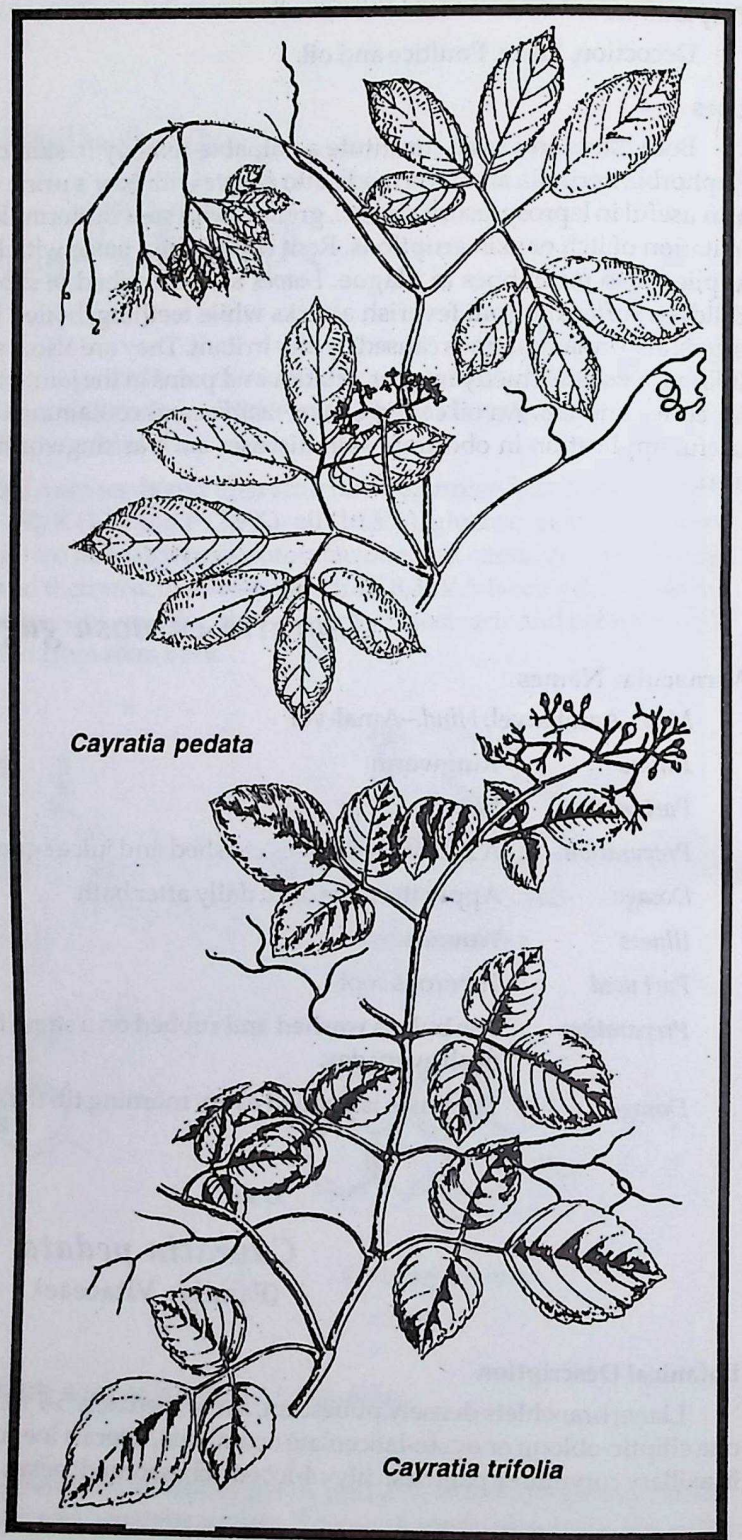
Cayratia trifolia
(Family: Vitaceae)

Botanical Description

Tendril climber; leaves alternate, pedately trifoliate; leaflets ovate or elliptic-obtuse, serrate, glabrous, 10 × 6 cm, laterals unequal-sided and smaller, 7 × 5 cm; flowers green in corymbose panicles; calyx tube 0.5 mm; petals 4, greenish white; disc obscurely lobed, apically crenulate; stamens 4, filaments short; ovary 2-celled; berry obovoid; seeds 2, pyriform.

Habitat

Peninsular India, Sri Lanka, China, Indo-China and Malaysia.



Cayratia pedata

Cayratia trifolia

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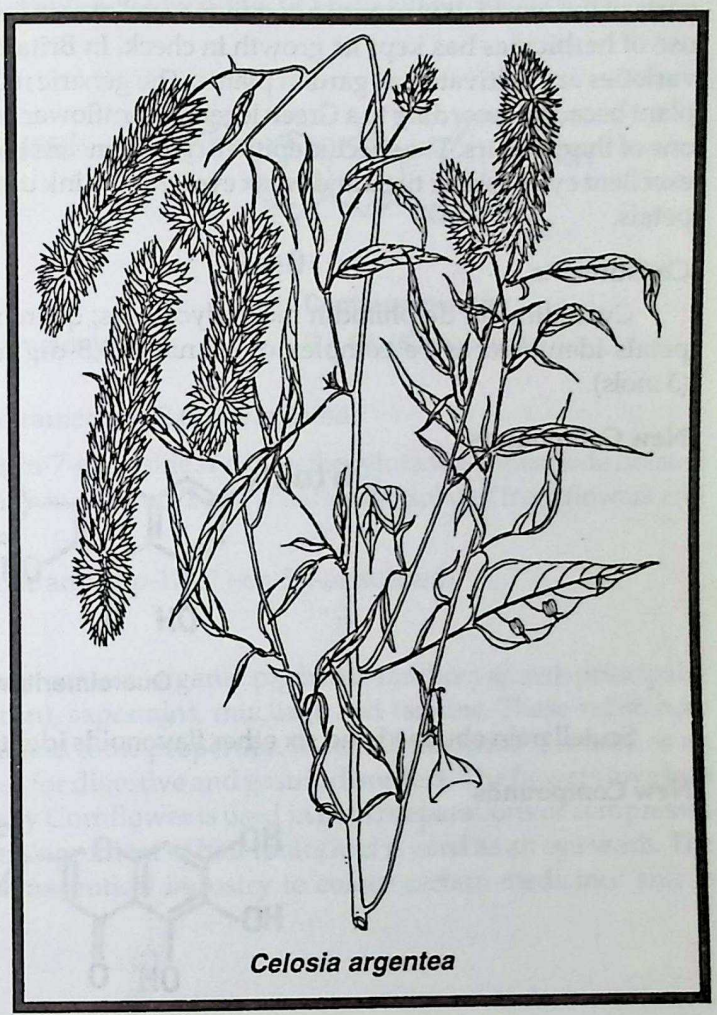
Celosia argentea, Linn.

Vernacular Names

Eng.–Quail Grass; *M.*–Kurdu; *Hind.*–Sufaid murgha.

Illness	:	**Fever**
Part used	:	Seeds
Preparation	:	1 teaspoonful of seeds crushed fine, a little sugar added and taken with 1 cup of water.
Dosage	:	1 teaspoon of crushed seeds are taken in the morning and evening for 3 days.
Illness	:	**Inability to pass urine**
Part used	:	Roots or seeds
Preparation	:	Either 1 fistful roots or 1 teaspoonful of seeds are pounded fine and a cup of 10 minute cold infusion prepared.
Dosage	:	1 cup in the morning and evening, till cured.



Celosia argentea

Centaurea cyanus, Linn.

(Family: Compositae)

Vernacular Name

Eng.–Cornflower.

Botanical Description

An annual herb with an erect, branched, wiry stem and alternate, greyish, downy, linear-lanceolate leaves. The solitary terminal flowerheads, borne on long stalks, have large bright-blue tubular florets. The fruit is a flattened silverish achene with a short pappus of rough hairs. Bees find the flowers very attractive.

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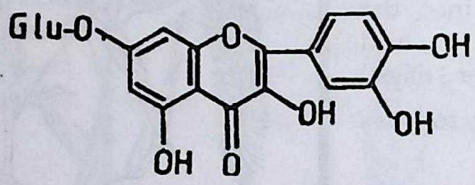
Habitat

Native to the Mediterranean region, Cornflower has spread with the cultivation of corn to other parts of the world. It was once a common weed of cornfields and waste ground but in recent years the use of herbicides has kept its growth in check. In Britain it is becoming rarer in the wild, but many varieties are cultivated as garden plants. The generic name, *Centaurea*, was supposedly given to the plant because, according to a Green legend, Cornflower healed a wound in the foot of Chiron who was one of the centaurs. The specific epithet, *cyanus*, means blue. Cornflower has long been regarded as an excellent eyewash for tired and weak eyes. A blue ink used to be made from the expressed juice of the petals.

Constituents

Cyanidin and delphinidin monoglycosides; quercimeritrin from aerial parts; blue pigment of petals identified as Fe complex of cyanidin–3,5-diglucoside (4 mols) and bisflavone-glucoside (3 mols).

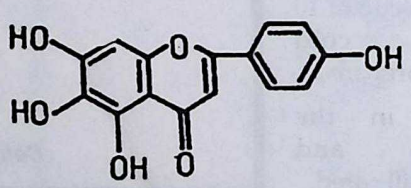
New Compounds



Quercimeritrin

Scutellarein obtained and six other flavonoids identified in aerial parts by PC.

New Compounds

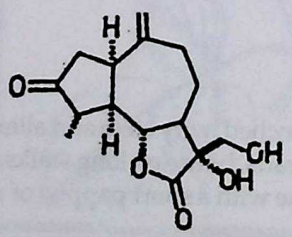


Scutellarein

Cnicin identified in foliage by TLC.

A guainolidae–4β,15-dihydro-3-debydro-solstitialin A–isolated and its structure determined; grosshemin, cynaropicrin, aguerin B, desacyl-cynaropicrin and solastitialin A monoacetate isolated from leaves.

New Compounds



4β,15-Dihydro-3-dehydro-solstitialin A

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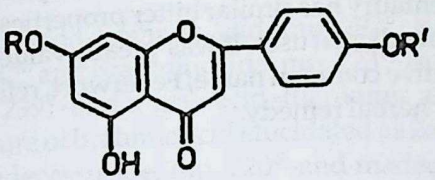
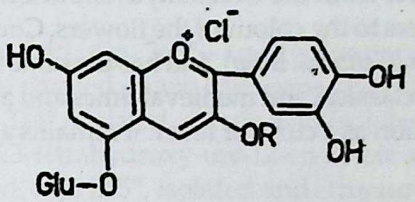
A cyanin previously isolated from flowers was named as centaurocyanin and identified as 3-O-(6''-O-succinyl-β-D-glucosyl)-5-O-(β-D-glucosyl)cyanidin; a new flavone also isolated from flowers and characterised as apigenin-4'-O-(6-O-malonyl-β-D-glucoside-7-O-β-D-glucuronide (I)

New Compounds



I

R = Gluc.acid, R' = Glu(6''-malonyl)



Centaurocyanin

R = Glu(6''-succinyl)

Ursolic acid and 5-hydroxy-3',4',6,7-tetramethoxyflavone isolated.

Luteolin-7-glycoside, 6-methoxyquercetin-7-glucoside and 6-methoxyluteolin-7-glucoside isolated from flowers; homoorientin, orientin, isovitexin, vicenin-2 and schaftoside isolated from flowers and identified.

5-Hydroxy-3;4',6,7-tetramethoxyflavone and hop-17(21)-en-3α-ol isolated.

Uses

The florets are used medicinally. They contain organic pigments (anthocyanins)–principally centaurin or cyanidin–a glycoside (cichoriin), saponnins, mucilage and tannins. These substances give Cornflower weak diuretic, astringent and tonic properties. In herbal medicine it is used as an infusion on its own or added to tea mixtures for digestive and gastric disorders. The flowers give teas and pot-pourris a pleasing colour. Externally Cornflower is used in bath preparations or compresses to treat wounds and skin ulcers. It is also an ingredient of hair tonics and is used as an eye wash. The isolated blue pigment is used in the pharmaceutical industry to colour certain medicines and in cosmetic preparations.

Centaurium erythraea
(Family: Gentianaceae)

Vernacular Name

Eng.–Common Centaury.

Botanical Description

An annual (in Britain) or biennial herb with a basal rosette of prominently veined oval leaves and an erect stem which branches at the top. The stem leaves are shorter, narrower, opposite and sessile. The bright rose-red, funnel-shaped flowers are arranged in flat-topped cymes. The corolla tube is much longer than the calyx. The anthers twist after shedding pollen. The fruit is a capsule with a persistent corolla.

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Habitat

Common Centaury grows throughout Europe. It is widespread and locally common in poor, dry grassy places in England, Wales and Ireland; in Scotland it is rarer. It is cultivated commercially for the pharmaceutical industry in central Europe. Like *Centaurea* the generic name of this species, *Centaurium*, originates from the Greek myth about Chiron, the centaur. The specific epithet, *erythraea*, means 'red' and refers to the colour of the flowers. Common Centaury has similar bitter properties to Great Yellow Gentian (*Gentiana lutea*), and has the same valuable medicinal uses. It was greatly valued as a medicinal herb in classical and medieval times and an alternative common name, Feverwort, refers to the plant's reputation as a cure for fever. It remains a popular herbal remedy.

Uses

The flowering stems are used medicinally. The main components are the glycosidic bitter compounds gentiopicrin and erythrocentaurin. The other constituents include traces of an essential oil and tannins. The bitter substances stimulate salivary and gastric secretions and Common Centaury is a popular digestive tonic and stomachic. In herbal medicine it is used in the form of an infusion for loss of appetite, digestive disorders and biliary conditions. A tincture prepared from the fresh plant is used in homeopathy for the same ailments. Common Centaury is also increasingly being used in making bitter herbal wines and liqueurs.

Centella asiatica, (Linn.) Urban

(Family: Umbelliferae, Apiaceae)

Vernacular Names

Sans.–Mandukparni.; *Hind.*–Manduki.

Parts Used

Whole plant and leaves.

Historical Aspects

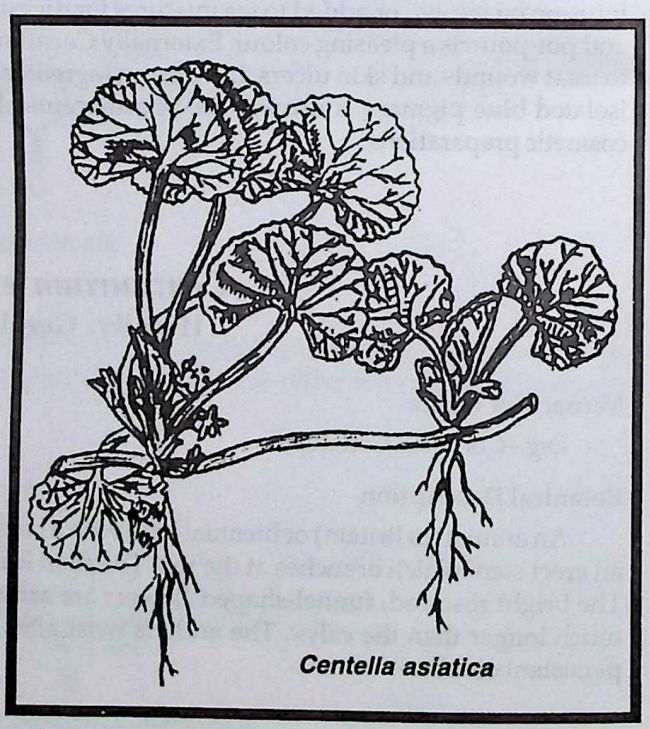
Mandukparni is described by Charaka as an anti-aging plant. It is sold in the vegetable market in Sri Lanka. In China too the plant has been used for many centuries as a brain tonic.

Habitat

Plant grows in marshy places all over India. It is also found in Sri Lanka and Madagascar. The plant grows upto the height of 2,000 m.

Botanical Description

It is a slender, herbaceous creeper. *Stems* are long, prostate, filiform, often reddish



Centella asiatica

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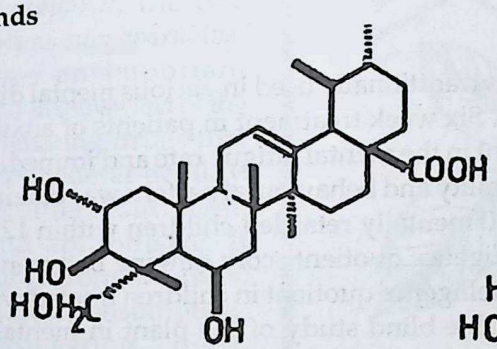
and with long internodes, rooting at nodes. Leaves are long-petioled, 1.3 to 6.3 cm in diameter, several from rootstock and 1 to 3 cm from each node of stem. They are orbicular, reniform, rather broader than long, glabrous on both sides and with numerous slender nerves from a deeply cordate base. *Fruit* 8 mm long, ovoid, hard with a thick pericarp.

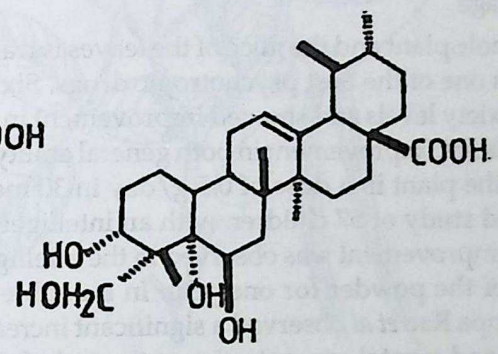
Constituents

Two triterpene acids–brahmic acid, mp. 293°, isobrahmic acid, mp. 263°– and two saponins–brahmoside, mp. 242° and brahminoside, mp. 223°–isolated and studied; a new triterpene glycoside–thankuniside, mp. 239°–and a new acid–thankunic acid, mp. 314°–isolated; asiatic acid isolated as methyl ester; structure of brahmic acid elucidated as 2α, 3β, 6β, 23-tetrahydroxy-urs-12-en-28-oic acid; new triterpene–madecassoside, mp. 220°–and madecassic acid, mp. 265°, isolated and structure of madecassic acid elucidated by chemical studies; new triterpene glycoside–isothankuniside, mp. 250°–isolated and shown to be composed of new isothankunic acid, mp. 288°, glucose and rhamnose.

New Compounds



Brahmic acid (Madecassic acid)



Isothankunic acid

Ayurvedic Properties

Guna: Laghu; *Rasa*: Tikta Kashaya; *Veerya*: Sheeta; *Vipaka*: Katu; *Dosha*: Kaphapittahara; *Karma*: Vayasthapana, Medhya, Kanthya, Varnya, Rochana, Hridya.

Pharmacology

Alcoholic extract prolonged the hypnotic effect of sodium phenobarbitone in mice and rats. It reduced the amphetamine toxicity by 20 to 30 per cent in mice. No protection was seen against convulsions produced either by metrazol in mice or by electric shock seizures in rats. Significant fall in rectal temperature of rats which was maximum at two hours, was shown with a dose of 100 mg/kg. A mixture of brahmoside and brahminoside glycosides from the plant increased the hexobarbitone-induced sleeping time, antagonising the amphetamine-induced agitation in mice. The Centella glycosides when injected into anaesthetised rats significantly lowered the blood pressure. Both the alcoholic extract and the glycosides showed mild tranquilising effect. Singh *et al* observed that alcoholic extract decreased the acetylcholine and histamine content of the whole brain homogenate of albino rats. Inhibition of the increase in acetylcholine in the brain in stressed rats was observed. However, catecholamines were increased.

Pharmacognosy

The macroscopic and microscopic characteristics of the plant have been described.

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Phytochemistry

The glycosides, brahmoside and brahminoside have been isolated with their genin brahmic acid. Presence of isobrahmic acid, and betulic acid have also been shown. The Madagascar variety contains different glycoside known as asiaticoside. Asiaticoside is not found in the Sri Lankan variety but a related compound, centelloside, and triterpenic acids, centoic acid and centellic acids have been reported. It has been shown that, depending on the habitat, the saponins can be of two types, the more common one containing asiaticoside and madecassoside and the less common one showing the additional presence of arabinose in the saponins thus forming brahmoside and brahminoside. The sapogenins and the flavonoid components were the same in both varieties.

Safety

Alcoholic extract was found nontoxic upto a dose of 350 mg/kg intraperitoneally in rats. No mortality was found upto a dose of 5 gm/kg in mice. In the doses commonly used no adverse reactions are reported.

Clinical Usage

The whole plant and the juice of the leaves is traditionally used in various mental disorders. It is regarded as one of the best psychotropic drugs. Six week treatment in patients of anxiety neurosis reduced anxiety levels and showed improvement in the mental fatigue rate and immediate memory span. Significant improvement in both general ability and behavioural pattern was obtained with the powder of the plant in a dose of 0.5 g/day in 30 mentally retarded children within 12 weeks. In a double blind study of 57 children with an intelligence quotient score ranging between 90 and 110, significant improvement was observed in the intelligence quotient in children treated with a dose of 0.5 g/day of the powder for one year. In a double blind study of the plant in mentally retarded children, Appa Rao *et al* observed a significant increase in the general mental ability, overall general adjustment and mental concentration at the end of six months.

Indications

1. Anxiety neurosis.
2. Minor memory disturbances.
3. As a psychotropic agent.

Formulations and Dosage

1. Juice of the leaves: 10 ml b.i.d.
2. Brahmi Ghrita: 5-10 ml b.i.d.
3. Ashtanga Ghrita: 5-10 ml. b.i.d.

Centrosema pubescens
(Family: Papilionaceae)

Botanical Description

Climber, brachlets pubescent; leaves 3-foliolate: leaflets ovate-lanceolate, 4.9 × 1.5-5 cm; thin-coriaceous, pubescent, base obtuse, margin entire, apex accuminate, mucronate; stipules persistent;

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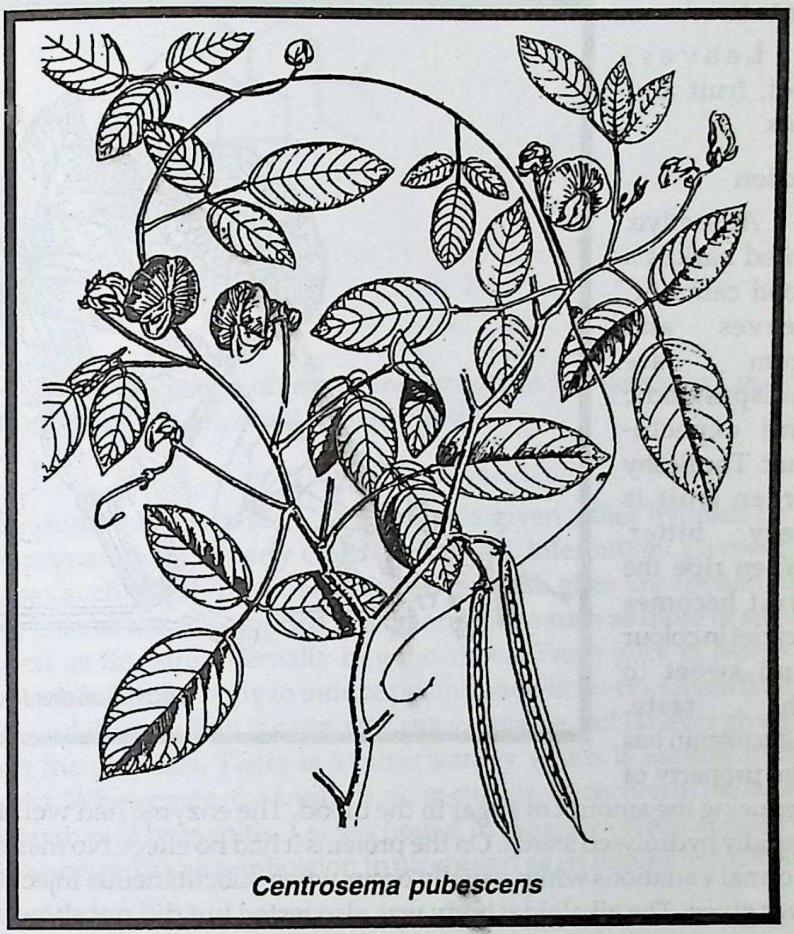
flowers pink in axillary racemes; calyx-tube campanulate glabrous, lobes unequal; corolla exserted, papilionaceous; pod oblong, compressed, 4-ribbed, glabrescent.



Centrosema pubescens

Habitat

A native of tropical America, now widely cultivated and often naturalised.

Uses

Mudgaparni is often used along with *masaparni*, the two together known as *supyaparnidvayam* and forms an important ingredient or the *Jivaniyagana* of the group or rejuvenating drugs that are indicated in general debility. *Mudgaparni* is bitter, cold, light, germicidal and aphrodisiac. It arrests bleeding from wounds, cures eye diseases, consumption, swelling, indigestion, piles, diarrhoea, cough, rheumatism, fever, burning sensation and is effective in all diseases caused by the discordance of *vata*, *pitta* and *kapha*. Roots and sometimes the whole plant are used in medicine. The drug enters into the composition of preparations like *Dhanavantaram kulambu*, *Vidaryadi leham*, *Mahakalyanakaghrtam*, *Mahamasatailam*, *Amrtaprasa ghrtam*, etc.

Cephalandra indica
(Family: Cucurbitaceae)

Vernacular Names

Sans.–Vimboshta, Vimbaja, Bimba, Tundika; *Hind.*–Kanduriki-bel; *Punj.*–Kanduri; *Pers.*–Kabare-hindi; *Guj.*–Gholi; *Bom.*–Bhimb; *Mah.*–Ran-tondala, Tondli; *Mal.*–Kova; *Tam.*–Kovai; *Tel.*–Dondatiga, Kakidonda; *Can.*–Tonde-konde, Tonde-kayee; *Ben.*–Tala-kucha.

Habitat

Grows in a wild state abundantly in Bengal and in most parts of India.

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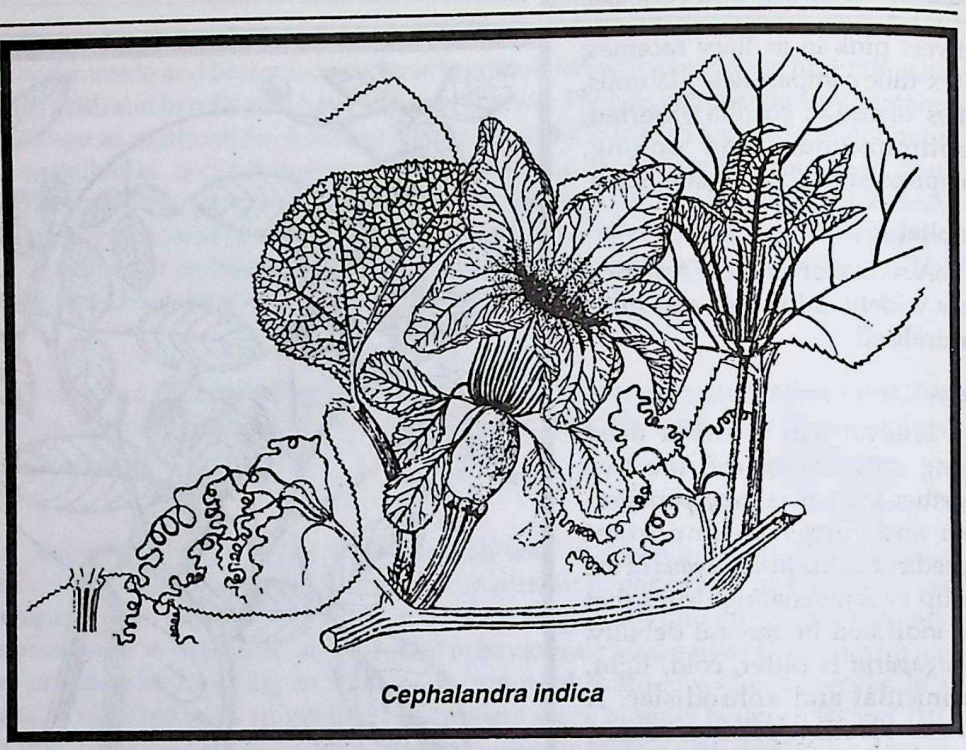

Cephalandra indica

Parts Used

Leaves, root, fruit and bark.

Action

Alterative. Dried bark is a good cathartic. Leaves and stem are antispasmodic and expectorant. The fleshy green fruit is very bitter. When ripe the fruit becomes scarlet in colour and sweet to the taste. Glucokenin has the property of reducing the amount of sugar in the blood. The enzyme had well-marked amylolytic properties and rapidly hydrolysed starch. On the proteins it had no effect. No marked effect was produced besides the normal variations whim usually occur when subcutaneous injection of the hormone for blood sugar was given. The alkaloidal body was also tested but did not show any pharmacological action on the heart, respiration, blood pressure and isolated uterus. Neither the alkaloid nor the enzyme had any sugar-reducing properties when administered to rabbits. The plant has the reputation in Bengal of having a remarkable effect in reducing the amount of sugar in the urine of patients suffering from diabetes mellitus. It has been described by some as the 'Indian substitute for insulin' and among the medical practitioners in Kolkata a strong belief exists as to its efficacy in glycosuria. The green juice extracted from the plant was tried in some of the surgical cases suffering from glycosuria in the Calcutta Medical College Hospitals with apparently beneficial results. The quantity of sugar was said to be greatly reduced and in some cases entirely disappeared.

Constituents

Roots contains resin which is soluble in caustic soda and in amylic alcohol, and an alkaloid, starch, sugar, gum, fatty matters, an organic acid and ash 16 p.c. which contains no manganese. "Collip isolated a substance called Glucokenin. The exposed juice taken from the crushed plant, when analysed was found to contain an enzyme, a hormone and traces of an alkaloid.

An orally effective hypoglycaemic principle, comparable to tolbutamide, isolated from roots; β-amyrin, lupeol and a bitter glycoside containing cucurbitacin B, from fruit; cephalandrol, mp. 81°, tritriacontane, β-sitosterol, cephalandrine A and cephalandrine B from aerial parts; stigmast-7-en-3-one, mp. 154°, form roots.

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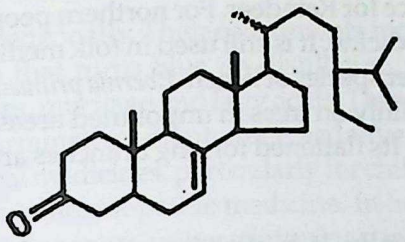
New Compounds



Stigmast-7-en-3-one

Preparation

Tincture (1 in 10), *dose* ½ to 1 drachm. Decoction of leaves and stem (1 in 10), *dose* ½ to 1 ounce; Powder of dried bark, *dose* is 30 grains; juice of root, *dose* 1 to 3 drachms.

Uses

Fresh expressed juice from the tuberous roots, stem and leaves is given either by itself or in combination with certain metallic preparations in early cases of diabetes, intermittent glycosuria, enlarged glands and in skin diseases such as pityriasis. Leavees mixed with ghee are applied like liniment to sores and skin diseases. Leaves are also applied to skin eruptions such as those of small-pox, and the plant is generally used as tincture internally in gonorrhoea. Fresh juice of leaves is applied to the bites of animals; also applied to the body to induce perspiration in fevers. Green fruit is chewed to cure sores on the tongue, and the ripe fruit is eaten raw as a vegetable, but is never given to children as it is supposed to blunt the faculties. There is a bitter variety which is useless; under cultivation the fruit loses its bitterness. When green, the fruit is used in curries. Decoction of the leaves and stem is useful in bronchial catarrh and bronchitis. Leaves boiled in gingelly oil are applied to ringworm, psoriasis and itch; oil is also used as an application to ulcers and as an injection in chronic sinuses.

Cetraria islandica
(Family: Parmeliaceae)

Vernacular Name

Eng.–Iceland moss.

Botanical Description

A shrub-like lichen (not a moss) with an erect, much-branched thallus which forms entangled mats. The lobes of the thallus are brown to olive green, fringed and may be slightly incurved, especially when dry. The thallus may be spotted red at the base; the paler convex lower surface is often spotted white. As it dies off the thallus turns a rust brown.

Habitat

Iceland Moss grows on poor, acidic soil, generally in the ground layer of pine woods, on trees, rocks and walls, in mountain and moorland regions in central and northern Europe and other northern

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parts of the world. In the British Isles it grows mainly in the Scottish Highlands. In Arctic regions it provides an important food source for Reindeer. For northern peoples too Iceland Moss has long been a food plant and a traditional medicine. It is still used in folk medicine for its nutritive properties and for treating chest ailments. Another species of lichen. *Evernia prunastri*, has similar medicinal properties. It is found in Britain growing mainly on trees in unpolluted areas, but it may also be found on fence posts and on rocks in wet places. Its flattened forking branches are very distinctive.

Uses

The thallus is used medicinally. It is effective when fully grown but still green. The main constituents are abundant mucilage with lichenin and isolichenin, bitter organic acids, carbohydrates, traces of iodine und vitamin A. The mucilage has expectorant and antitussive properties and Iceland Moss is thus beneficial for coughs, hoarseness, whooping cough, tuberculosis and bronchial asthma. The bitter compounds stimulate the appetite and gastric secretions. Iceland Moss is contained in some proprietary medicines.

Iceland Moss can be ground and made into flour for baking bread and cakes. When gently boiled and cooled it makes a nutritious jelly.

Chamomilla recutita
(Family: Compositae/Asteraceae)

Vernacular Name

Eng.–Scented Mayweed.

Botanical Description

An annual herb with an erect, much-branched, glabrous stem with sparse, finely divided (two or three times pinnate) leaves. The solitary, terminal flowerheads have hollow, conical receptacles, white ligulate ray-florets and yellow tubular, five-lobed disc-florets. The ray-florets are spreading at first, later they are bent downwards baring the receptacle. The fruit is an ovoid ribbed achene. All parts of the plant are aromatic. This species is often confused with Chamomile (*Chamaemelum nobile*) but botanically it is not a 'true' chamomile and Scented Mayweed is now the preferred name. It can be distinguished from Chamomile by its hollow, not solid receptacle, which lacks chaffy scales between the florets.

Habitat

Scented Mayweed grows throughout Europe. In England and Wales it is locally common on arable land, waste ground and roadsides; in Scotland it is rarer. It is also a common garden plant. It is cultivated commercially for the pharmaceutical industry in central Europe and elsewhere. The former generic name, *Matricaria* comes from the Latin word *matrix* (= womb) or *mater* (= mother) on account of the ancient reputation of the herb as a treatment for female ailments.

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Uses

The flowerheads are used medicinally. Their constituents include up to 1 per cent of an essential oil with azulene (chamazulene) that turns blue on distillation, and bisabolol and farnesene; also flavonoid and coumarin glycosides, mucilage and fatty acids. These substances give Scented Mayweed anti-inflammatory, antiseptic, carminative, diaphoretic, sedative and antispasmodic properties. It is one of the most widely used herbal medicines, particularly for children's ailments. It is also a common treatment for teething problems in homeopathic medicine. In herbal medicine infusion is used for colds and influenza, indigestion, diarrhoea, urinary infections, insomnia and 'nerves'. Externally it is used in compresses and bath preparations and in eye and mouth washes.

Chamomilla suaveolens
(Family: Compositae)

Vernacular Name

Eng.–Pineapple Weed.

Botanical Description

An annual herb with an erect, much-branched glabrous stem and many finely divided (two or three times pinnate) alternate leaves. The solitary terminal flowerheads have hollow, conical receptacles and greenish-yellow, four-lobed tubular disc-florets. Unlike Scented Mayweed (*Chamomilla recutita*), it has no ray-florets. The bracts encircling the flowerheads have white papery tips. The fruit is a ribbed achene. All parts of the plant are strongly aromatic but less pleasantly so than Scented Mayweed.

Habitat

Pineapple weed is probably a native of north-east Asia but long ago it became established in North America from where, in the 19th century, it was introduced to Europe. It spread rapidly and it is an increasingly common weed of waysides, tracks and trampled gateways. It is found throughout the British Isles. In cooler regions where Scented Mayweed does not grow it serves as an excellent substitute for the latter. The common name, Pineapple-weed, may refer to the plant's rounded flowerhead or to the strong pineapple or apple scent. The specific name, *suave-olens*, means 'sweet-smelling'.

Uses

The flowerheads are used medicinally. The constituents include an essential oil (but there is less than in Scented Mayweed or Chamomile, *Chamaemelum nobile*), tannins, glycosides and a bitter compound. Pineapple weed has the same uses as Scented Mayweed except that it is not anti-inflammatory. It is now rarely used in herbal medicine but an infusion is effective for influenza and digestive disorders and it is anthelmintic. Externally it can be used as a mouth rinse and gargle and in treatments for skin disorders.

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Chelidonium majus
(Family: Papaveraceae)

Vernacular Name

Eng.–Greater Celandine.

Botanical Description

A perennial herb with a taproot and erect, brittle, branched leafy stem. The leaves, which are paler on the underside, are alternate and almost pinnate, with the terminal leaflet three-lobed. The terminal bright-yellow flowers are arranged in loose umbels. The fruit is a thin green capsule which splits from the bottom upwards. The seeds are black with a white appendage. The stem and leaves exude an orange sap (latex) when fresh and broken. This milky juice stains the hands and burns the skin and eyes.

Habitat

Greater Celandine, which is not related to Lesser Celandine (*Ranunculus ficaria*), is probably native to the British Isles. It is common on banks, hedge banks and walls, often near houses. It has a more local distribution in Scotland and Ireland. The generic name, *Chelidonium*, comes from the Greek word *khelidon* (= a swallow) supposedly because the plant's flowering period coincides with the arrival and departure of swallows.

Uses

The flowering stems are used medicinally. The constituents include up to 4 per cent of alkaloids (including chelidonine, chelerythrine, sanguisorbine and berberine) bound to chelidonic and other acids; also truces of an essential oil, saponins and carotenoid pigments. Greater Celandine has antispasmodic, mild sedative and antiseptic properties and it is used in medical practice to alleviate stomach, gallbladder and intestinal pains. It is also a vasodilator and hypertensive. A tincture is used in homeopathy and in folk medicine the ointment prepared from Greater Celandine is used to treat chronic eczemas. The alkaloid chelidonine affects cell division (as does colchicine) and Greater Celandine is one of many plants being investigated for potential anti-cancer properties. Strong doses of Greater Celandine cause severe gastro-enteritis, violent coughing and breathing difficulties. *All internal use should thus be under strict medical supervision. The use of fresh juice to remove warts is also dangerous.*

Chenopodium ambrosioides, Linn.
(Family: Chenopodiaceae)

Vernacular Names

Eng.–Mexican Tea, Jerusalem Oak, American Wormseed; *Mah.*–Chandanbatva; *Mal.*–Kutu-ayam dakam.

Botanical Description

An annual herb with a branched, reddish, leafy stem. The alternate leaves are oblong to lanceolate and coarsely toothed. The numerous, small, yellowish-green flowers are crowded together in small

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globose clusters in the leaf axils on the lateral stems. The fruit is an achene. All parts of the plant have a pleasant fragrance, hence the specific name, *ambrosioides*. The generic name, *Chenopodium*, is derived from the Greek word *khen* (= goose) and *pous* (= foot) and refers to the shape of the leaves.

In the 17th century American Worm-seed was brought from the tropical regions of America to Europe, where it became acclimatized and in some places naturalized, but not in the British Isles. In South America the leaves have been used in places of ordinary tea, but the principle use of the plant has long been to expel intestinal worms. The cultivated variety (*C. ambrosioides* var. *anthelmintium*) is grown on a large scale as an anthelmintic. Two closely related plants, Fat Hen or White Goosefoot (*Ch. album*) and Common Orache or Iron-root (*Atriplex patula*), are edible and are good substitutes for spinach. Both are common in the British Isles on cultivated and waste ground. The species of orache grown as a vegetable is *Atriplex hortensis*.

Chenopodium ambrosioides

Habitat

Annual or perennial pot-herbs, generally 6 or 7 species are met with in South India, Bengal, Sylhet, Chennai and Mumbai Presidencies. The fruit from which oil is expressed is somewhat globular, frequently more or less compressed, with a thin greyish brown pericarp. The seeds are reddish, brown or black, kidney shaped and shiny, and have a strong euclauptus-like aromatic odour and a bitter and pungent taste.

Chemical Composition and Properties of Chenopodium Ambrosioides

The active principle of chenopodium is a volatile oil which, like most of the substances of this class, is a mixture of various constituents. The oil has no definite boiling point and when it is heated to 100°C in the air, it explodes with great violence. Different specimens of the oil differ much in their physical characters; the colour may vary from pale yellow to bright golden yellow. The toxicity of different stocks also varies considerably. The chemical composition of the oil has been extensively studied and though there is diversity of opinion regarding minor details the following composition may be taken as the standard:

1. Ascaridole varying from 45 to 70 per cent of the total oil in different samples. It has a definite chemical composition $C_{10}H_{16}O_2$.
2. Small portions of an isomer of ascaridole, the glycol anhydride oil its corresponding hydrate, in proportions of 5 per cent or more of the total oil.
3. A mixture of various liquid hydrocarbons, containing cymene, a-turpinene, a new laevo-turpense, etc., making about 30 per cent of the total.
4. Traces of lower fatty acids, chiefly butyric acid, and about 0.5 per cent of methyl salicylate.

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The Indian chenopodium oil-both from C. ambrosoides and C. anthelminticus was examined by Henry and Paget at the Wellcome Bureau of Scientific Research. The yield of the oil according to their estimation was lower. The percentage of oil yield from C. ambrosoides was 0.17, and from C. anthelmintica 0.24. The oil expressed from the Indian seeds was found to be lighter in colour, and had an odour somewhat different from that of the American wormseed oil derived from C. ambrosoides, var. anthelminticum.

The constants of the Indian oil as compared with those of American wormseed oil are as follows:–

Nature of oil	*Sp. gr. at 15°C*	*Sp. Rotation*
C. ambrosioides (Indian)	0.9399	+0.07°
C. anthelminticum (Indian)	0.9080	–9.6°
American Wormseed oil	0.9669	–5.6°

It will be seen from the above that in Indian chenopodium oil differs from good American chenopodium oil in containing less of the active principle, ascaridole, viz.. only about 46 per cent in place of 65 per cent or more. Another difference lies in the nature of the hydrocarbons present. The American oil contains about 30 per cent of this fraction of which about half is cymene and the other half a mixture of terpinene and a laevo-rotatory terpene. The hydrocarbon fraction of the Indian oil on the contrary is p-cymene with a small amount of dextro-rotatory terpene. The specifications of the United States Pharmacopoeia are that the oil shall have a specific gravity of 0.955 to 0.980 at 25°C, shall be soluble in 8 volumes of 70 per cent alcohol and shall have an optical rotation between 40 and 10 in a 100 mm tube at 25°C. The mixed Indian oil therefore obviously falls short of these specifications.

In view of the differences between the two specimens of oil as outlined above, the Indian oil may be considered to be very much inferior. The results achieved so far clinically with the Indian oil are, however, said to have been satisfactory.

Constituents

The fresh vegetable chenopodium ambrosiodes contains 86.59 moisture; and the dried material contains Ether extract 5.14; Albaminoids 18.18 containing Nitrogen 2.91; soluble carbohydrates 59.23; woody fibre 7.31 and Ash (containing sand 2.61) 10.14 p.c. respectively.

Uses

Chenopodium was used by the American Indians, and in South America, in infusions made from leaves and seeds as a household remedy against intestinal parasites. The leaves and tender stems are used as vegetables. Seeds or the fruits and the volatile oil obtained by distilling the fruits (seeds) and the half dried aerial parts of C. ambrosioides with steam or water, are used as anthelmintic chiefly for ascaris, ascarides and ankylostomum. The oil of chenopodium is obtained principally from chenopodium ambrosioides; varieties–anthelminticum or American wormseed commonly known as 'Maxican Tea'; the oil in 10 minim doses will expel hookworms. Some one tried it against hookworms in 3 c.c. doses with castor oil and chloroform, and obtained results superior to those obtained with thymol, beta-naphthol, etc. It was also extensively tried by various workers and proved a very valuable anthelmintic against many forms of intestinal parasites (round-worm infestations) and hookworm disease. Indian chenopodium oil is used as the alternative or substitute for carbon tetrachloride, or frequently used in combination with it. Soper (1924) called attention to the fact (asserted) that the proportions of the two drugs should depend on the nature of the worms harboured. Carbon

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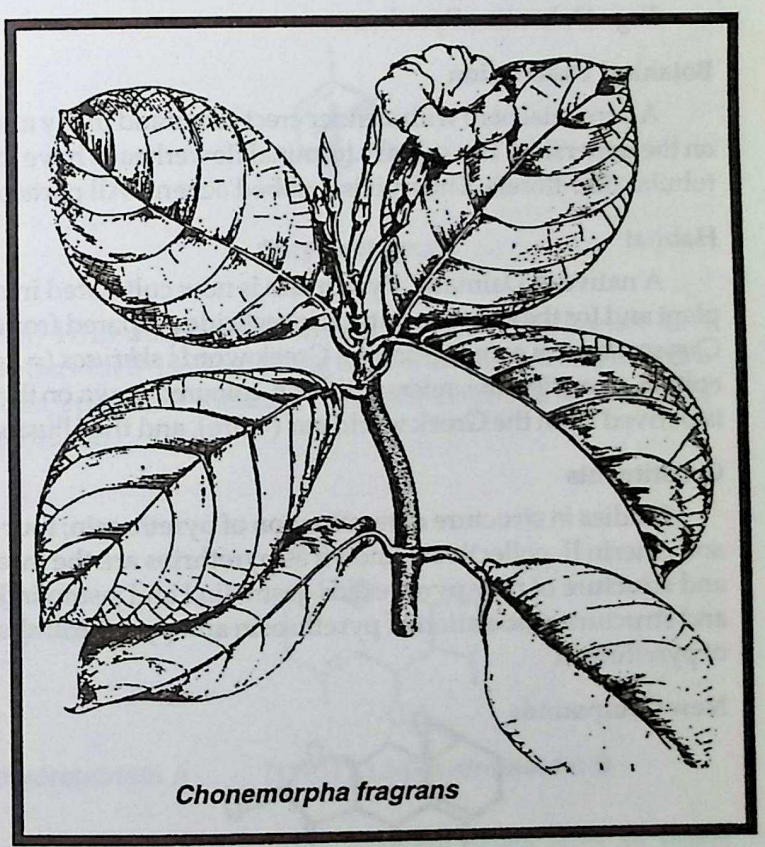
tetrachloride alone is said to be more effective against pure necator infection and chenopodium for ascaris infections, whereas ankylostoma infections are apparently most readily cured by a combination of the two with a relatively high proportion of chenopodium. The dose of chenopodium oil when given in combination with carbon tetrachloride is comparatively much smaller (1.0 c.c.) than when given by itself (3.01 c.c.). Maplestone has obtained much better results by the treatment of ascaris infections with a combination of Santonin grains with chenopodium oil 1.0 c.c. in a capsule. Chenopodium oil is also used for eradication of intestinal parasites of domestic animals and agricultural cattle. Other plants of the same order contain volatile oil which is useful as antispasmodic, aromatic, nutritious, laxative, carminative and stimulant, besides being anthelmintic.

The flowering stems of American Wormseed are used medicinally. The constituents include an essential oil with ascaridole as the main component, saponins, tannins and bitter compounds. An infusion prepared from American Wormseed has anthelmintic, antispasmodic, stomachic and tonic properties. It has also been recommended for asthma, nervous disorders and for menstrual disorders. Nowadays, however, the main use of the plant is as a source of the essential oil (chenopodium oil), which is obtained by distillation from the fresh plants and is used particularly against roundworm and hookworm. *American Wormseed and the oil from it are poisonous in large doses and they should be used only under strict medical supervision.*

Chonemorpha fragrans
(Family: Apocynaceae)

Botanical Description

Large, laticiferous, climbing shrub covered with dense rusty tomentum; leaves large, simple, opposite, short-petioled, ovate or elliptic-acute, subcordate at base, tomentose, more densely beneath; flowers white turning yellow, fragrant, in terminal cymes; calyx campanulate, 5 lobed; corolla tube short, cylindrical slightly expanded above the base, lobes 5, overlapping to the right; stamens 5, epipetalous, filaments short, villous, anthers included, sagitate, pistil bicarpellary, style filiform, ending in a hemisphere stigmatic head, follicles about 25 cm long.



Chonemorpha fragrans

Habitat

The plant occurs throughout India. It is common in the moist, semidecidous forests of Kerala from the plains upto 2,500 ft.

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Uses

Murta is one of the twenty two drugs that constitute the emetic groups, *Madanadi gana*. It is reported to be bitter, heavy of digestion, laxative and useful in urinary, heart and skin diseases and intermittent fevers. It controls morbid *kapha* and *vata*, cures vomiting and purifies blood. Root, which is the officinal part is an ingredient of preparations like *Ayaskrti, Varanadi kasayam, Yogarajaguggulu. Ceriya Laksadi tailam*, etc.

Important synonyms attributed to the drug indicate that it is a climber (*murva, morata*) having a characteristic exudate (*srava, sruva*), an easily separable bark (*prthaktvaca*) and leaves resembling cow's ears (*gokarni*). The plant is highly fibrous and is useful in making bow strings (*dhanurmala, dhanurguna*).

Chrysanthemum cinerariifolium
(Family: Compositae/Asteraceae)

Vernacular Name

Eng.–Dalmatian Pyrethrum.

Botanical Description

A perennial herb with slender erect stems and many alternate, finely divided leaves that are felted on the underside. The solitary terminal flowerheads have long, white, ligulate ray-florets and yellow, tubular disc-florets. The fruit is a ribbed achene. All parts of the plant are strongly aromatic.

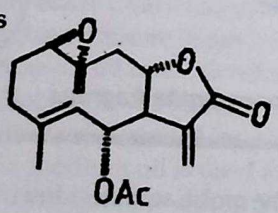
Habitat

A native of Dalmatia, Pyrethrum is now cultivated in many parts of the world as an ornamental plant and for the effective natural insecticide prepared from the dried flowerheads. The generic name *Chrysanthemum* comes from the Greek words *skhrusos* (= gold) and *anthemon* (= flower); the specific epithet, *cinerariifolium*, refers to the ash-coloured down on the leaves; and the common name Pyrethrum is derived from the Greek world *pur* (= fire), and the allusion to the taste of the root.

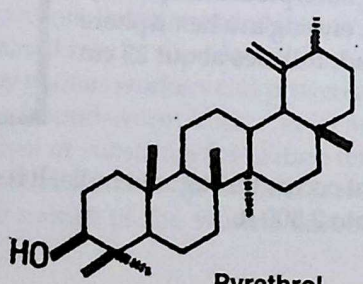
Constituents

Studies in structure determination of pyrethrosin; four easters–pyrethrin I, pyrethrin II, cinerin I and cinerin II–collectively known as pyrethrins are the insecticidal constituents of flowers; isolation and structure of new pyrethroids–jasmolin I and jasmolin II; extraction of pure pyrethrins; isolation and structure elucidation of pyrethrosin and pyrethrol; absolute configuration and crystal structure of pyrethrosin.

New Compounds



Pyrethrosin



Pyrethrol

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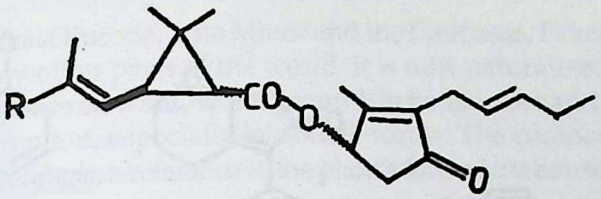
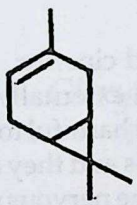


Jasmolin I
R = Me
Jasmolin II
R = COOMe

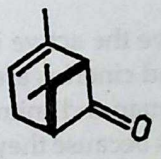
Seven glucosides of quercetin, quercetagetin and luteolin, a small amount of kaempferol glycoside, chlorogenic and isochlorogenic acids detected in petals.

dl-Camphor, azulene and β-3-carene, bp. 70°/30 mm., obtained by distillation of flowers; chrysanthenone from essential oil; isolation of a new sesquiterpene lactone–yehuja lactone–along with chamazulene from flowers.

New Compounds



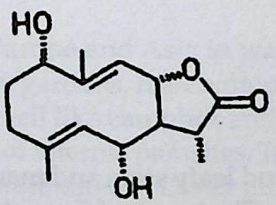
β-3-Carene



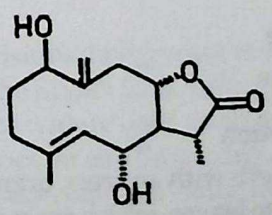
Chrysanthenone

Three new sesquiterpene lactones–(11R)-11,13-dihydrotatridin A, (11R)-11,13- dihydrotatridin B and (11R)-6-O-β-D-glucosyl-11,13-dihydrotatridin B–isolated along with tatridins A,B and dihydro-β-cyclopyrethrosin, jaceidin, apigenin, luteolin, apigenin-7-galacturonic acid methyl ester and apigenin-7-glucuronic acid and their structures determined.

New Compounds



(11R)11,13-Dihydrotatridin A



(11R)11,13-Dihydrotatridin B

Two new plant growth inhibitors–chrycorin and chrycolide–isolated along with an insect antifeedant (I) and their structures elucidated.

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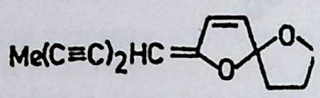
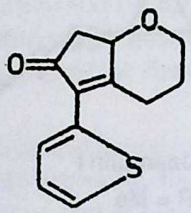
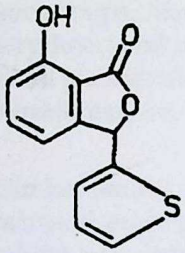
New Compounds



I



Chrycorin



Chrycolide

Biological Activity

Antifeedant compound at 400 µg/g controlled male silkworm 5th insect larvae.

Chrysanthenone (43.24), β-caryophyllene oxide (12.36), limonene (10.70) and α-pinene (8.50%) isolated from essential oil of aerial parts, β-sitosterol, α- and β-amyrins and their acetates, friedelin and sesamin identified in nonvolatile fraction; acacetin-7-O- β-D-galactopyranoside isolated from flower; acaciin, luteolin-7-glucoside and quercetin glycoside isolated from flowers.

Uses

The flowerheads have the active ingredients pyrethrins and cinerins, plus an essential oil and glycosides. Pyrethrins and cinerins are contact insecticides used externally to kill insects and other pests living on the skin of man and animals as well as those that are harmful to plants. These substances are important insecticides because they are non-toxic to mammals and they do not accumulate in the environment or in the bodies of animals. They act by paralysing the nervous system of insects and the animals do not become resistant to them. The actions of pyrethrins and similar subtances are still the subject of research. Pyrethrum is not used medicinally.

Chrysanthemum parthenium
(Family: Compositae)

Vernacular Name

Eng.–Feverfew.

Botanical Description

A perennial herb with an erect, branched, downy and leafy stem and many alternate, yellowish, pinnate to bipinnate leaves, which are sometimes downy. The terminal flowerheads with short, broad, white ligulate ray-florets and yellow, tubular disc-florets are arranged in loose corymbs. It is distinguished from Chamomile (*Chamaemelum nobilis*) in having a flat, not conical receptacle, an upright stem and less finely divided leaves. The fruit is a ribbed achene without a pappus. All parts of the plant are strongly aromatic.

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Habitat

Probably native to south-east Europe, Asia Minor and the Caucasus, Feverfew has spread via the Mediterranean region to many other parts of the world. It is now naturalized over most of Europe, including the British Isles. It grows on walls, waste ground, in hedgerows and other disturbed places and is also a common garden plant, especially in double forms. The comnon name, Feverfew, is a corruption of the Latin word *febrifugia*, a reference to the plant's former use as a fever-reducing medicine or 'febrifuge'.

Uses

The flowerheads, sometimes also the flowering stems, are used medicinally. The dried herb has a penetrating aroma and must always be stored well away from other herbs. It contains an essential oil with camphor (so-called chamomile camphor), bitter compounds, tannins and mucilage. Herbalists use an infusion as a stomachic, mild sedative, disinfectant, antispasmodic and mild anthelmintic. Feverfew is also receiving increasing attention from the medical profession as a safe herbal treatment for migraine. In Britain a clinical trial is in progress and scientists have isolated new substances from the plant, which seem to oppose the actions of prostaglandins. Prostaglandins are naturally occurring substances in the body that may play a part in causing migraine. Externally a strong infusion of Feverfew soothes swellings and open wounds and is a mouth rinse after tooth extraction.

Chrysanthemum vulgare
(Family: Compositae)

Vernacular Name

Eng.–Tansy.

Botanical Description

A perennial herb with an erect, angled, almost hairless stem, usually reddish and branched at the top. The alternate dark-green leaves are pinnately lobed and toothed. The terminal, rayless, button-like flowerheads, which are made up of short, tubular, bright-yellow florets, are arranged in dense flat-topped corymbs. The fruit is a greenish-white, ribbed achene.

Habitat

Tansy grows wild in Europe and Asia in waste places, roadsides, hedgerows and other grassy places and it is also grown in gardens. It is common throughout the British Isles. All parts of the plant, particularly when dried, smell like camphor and Tansy was once widely used as an insect repellent and to rid man and animals of internal parasites. Tansy was also popular as a flavouring and colouring, and Tansy cakes or tansies were eaten at Easter time. The names *Tanacetum* and Tansy are both thought to derive from the Greek word *athanatos* (= immortality) because the plant was believed to have powers of prolonging life–or because it is very persistent once it has been planted.

Uses

The flowerheads and leaves are used medicinally. They should always be stored well away from other herbs. The principal constituent is an essential oil (0.2-0.6 per cent) with the poisonous thujone.

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The other constituents include bitter compounds (tanacetins), tannins and organic acids. Tansy has a variety of medicinal uses but it is now mainly used as an anthelmintic–but there are safer remedies. An infusion or powder has been used for this purpose. The essential oil obtained by distilling the fresh flowering stems is used in homeopathy for worms and an emmenagogue. *Tansy should be used internally only under strict medical supervision;* large doses are powerful irritants and may also cause kidney and brain damage. Externally Tansy is applied to swellings, bruises and various veins.

Cichorium intybus, Linn.
(Family: Compositae)

Cichorium intybus

Vernacular Names

Eng.–Endive, Wild Chicory, Chicory; *Punj.*–Hand, Gul, Suchal; *Hind., Bom., Guj. & Ben.*–Hinduba, Kasni; *Chin.*–Kuku, Ku-tsai; *Mah.*–Kachani; *Pers.*–Kasni, Ambuboia; *Tel.*–Kasini-vittulu; *Tam.*–Kasini-virai; *Arab.*–Hindyba, Shikoriah, Bazarula, Rundiba; *Pers.*–Tukhm-e-Kasani.

Botanical Description

A perennial herb with a long taproot and a stiffly erect, branched, angled and furrowed stem. The leaves in the basal rosette are stalked, deeply pinnately toothed and hairy beneath; the stem leaves are sessile and lanceolate. The flowerheads, arranged in clusters of two or three, grow from the upper leaf axils. The bright-blue florets are all ligulate. The fruit is an achene. All parts of the plants are glandular.

Habitat

N.W. India, the Deccan, the Punjab, Kashmir, Persia and Europe.

Parts Used

Seeds, root and flowers.

Chicory grows throughout Europe in fields, hedgerows and on roadsides. It is locally common especially on lime-rich soils in England and Wales; it is rare, and probably introduced in Scotland and Ireland. Chicory was an important medicinal herb and vegetable and salad plant in ancient Egyptian, Greek and Roman times; since the 17th century dried, roasted and ground roots have been used as a coffee substitute or adulterant. Varieties of Chicory are widely grown for the roots and for the blanched heads (chicons), which are produced by forcing the roots in darkness and warmth. They are a popular salad ingredient. The related Endive (*C. endiva*) is also grown for salads. The generic name, *Cichorium*, is said to be of Egyptian origin (perhaps from

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kehsher). The common names Chicory and probably Succory derive from it. The specifie name, *intybus*, comes from the Arabic word *hendibeh* for the plant and this source also gave Endive its name.

Constituents

Synthesis of scopoletin; an improved method of isolation of cichoriin (60%) from inflorescence.

Seeds contain a bland oil. Burnt chicory contain sugar, free extractivt, cellulose, ash nitrogenous matter, fat, etc. Roots contain nitrate and sulphate of potash, mucilage; some bitter extractive principle and *enrulin* 36 p.c. Flowers contain a colourless crystalline glucoside soluble in alkalies, hot water and alcohol; glucoside, cichoriin, bitter substances lactucin, intybin, As-0,01 mg. in 100 g. root.

Biological Activity

Apigenin showed 15-fold greater inhibition of phosphodiesterase preparation from rabbit myocardium than 1-methyl-3-isobutylxanthopterin. Perfusion of isolated toad heart with 50-100 µg quercetin increased myocardial content of cAMP by 40% keeping that of cGMP unchanged.

Preparation

Decoction of seeds (1 in 20), *dose*: 1 to 2 ounces; Fluid extract of the root, *dose*: 1 to 2 drachms; and Powder.

Action

Chicory closely resembles Taraxacum in its pharmacological properties; increases bite-secretion and promotes digestion; a stomachic and tonic; in large doses a mild aperient and diuretic. It has also alterative and resolvent effects. From its narcotic character it exerts an effect on the nervous system; hence chicory coffee is considered one of the many causes of amaurotic blindness. Seeds are carminative and cordial. Root is bitter.

Uses

Decoction of the seeds or *powdered seeds* are used in obstructed or disordered menstruation. A strong infusion of powdered seeds is useful in obstructions or torpor of the liver and in checking bilious enlargement of the spleen with general dropsy. *Root* is used as a substitute for coffee; with other vegetable bitters it is given in dyspepsis and fever. Chicory, which is prepared from fleshy dried older roots which are roasted and powdered, is often used to adulterate coffee, and sometimes as much as 90% of chicory bas been detected in "ground coffee". A simple test whereby to detect the presence of chicory is to put a little of the ground material in a glass of water. Coffee remains hard and floats on the surface for a long time; chicory soon softens and sinks, colouring the water more or less brown. In the Punjab and Kashmir, chicory is cultivated as a fodder, *Flowers* made into *sherbet* is given in liver disorders. Chicory is useful in removing gravel for which the following powder is very useful: Take of chicory 5, *Gokshura* 6, Melon seeds 7, Sweet fennel seeds 8; mix and make a powder. *Dose*: 30 to 4° grains. The plant is applied externally in inflammatory affections on account of its cooling properties.

The roots of wild plants are use medicinally. The dried root has a pungent and bitter taste. The constituents include the bitter compounds luctucin and intybin, inulin, (up to 58 per cent), tannins, sugars and vitamins. These substances give Chicory aperitif, stomachic, tonic, hypoglycaemic, mild diuretic and laxative properties. In herbal medicine a decoction is used for liver disorders, gallstones and kidney stones, and for inflammations of the urinary tract.

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Cichorum endivia, Linn
(Family: Compositae, Asteraceae)

Vernacular Names

Sans.–Kasani; *Hind.*–Hinduba, Kashi.

Parts Used

Seeds, roots, flowers.

Historical Aspects

Much valued as a cooling remedy and febrifuge in the traditional unani system of medicine. Used all over Europe as a tonic and appetite stimulant as chicory or endive.

Habitat

Grows in North West India, the Deccan plateau, Punjab, Kashmir and in Iran and many parts of Europe.

Botanical Description

Erect, glabrous or hispid herb, with diaricate branches, occasionally spinescent. *Leaves* upper subentire, lower pinnatifid. Head sessile on the branches or on thickened peduncles, homogamous, blue. *Flowers* all ligulate. *Bracts* involucral, inner 1-serrate, at length concave at the base with outer flowers in the concavity. Outer few shorter: receptacle flat, naked or sub-fimbrillate. *Achenes* glabrous, sub-5-angled, base contracted, tip truncate or the margin slightly produced: *pappus* pale short, 2-3 serrate. It is a perennial, believed to be a cultivated variant of C. *intybus* Linn.

Pharmacognosy

Has been worked out in detail, specially with reference to identification.

Phytochemistry

The leaves and pods contain 6-hydroxymusizin glucoside, tinnevellin glucoside, kaempferol glucoside, kaempfero-3-D-glucuronide, kaempferol-3-β-D-glucoside, kaempferol-3-(O-malonyl) D glucuronide luteolin, DC+7-dicaffeoultartaric acid, methyl caffeinate, ethyl caffeinate, ethyl 4-coumarate, methyl protocate chinate, methyl and ethyl esters of hydroxy cinnamic and benzoic acids: malic acid, citric acid, fumaric acid, succinic acid, quininic acid, nitrites and nitrates. The oil extracted from endive contains camphor, campene, phellodrene, immonene, β pinene, diterpene, cineole, terpinol and caryophyllene. The flowers contain the glycoside cichorin.

Ayurvedic Properties

Guna: Laghu, Snigdha; *Rasa*: Madhura, Tikta; *Veerya*: Sheeta (Root-Ushna); *Dosha*: Pitta, Kaphahara; *Vipaka*: Madhura; *Karma*: Balya, Shothaghna, Kamalahara, Mutrala, Chhardihara, Shwasakasahara, Krimighna.

Pharmacology

Cichorum plant species are seen to have prostaglandin like activity. Resembles taraxacum in its properties.

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Safety

No toxic effects found in the dose used.

Clinical Usage

The powder of dried root is used in the treatment of liver congestion, as a demulcent, and as an antidiarrhoeal.

Indications

1. Cough with dyspnoea
2. Hepatitis
3. As a mild diuretic.
4. Inflammatory swelling.

Formulations and Dosage

1. Dried root powder: 1-4 gms b.i.d./t.i.d. Also used topically.
2. Decoction: 20-60 ml b.i.d.

Cicuta virosa
(Family: Umbelliferae/Apiaceae)

Vernacular Names

Eng.–Cowbane, Water Heml.

Botanical Description

A perennial herb with a hollow; rigid, furrowed stem, which is tuberous and horizontally chambered at the base. The basal leaves are long-stalked, bi- or tripinnate with lanceolate, sharply serrate segments; the stem leaves have sheath-like stalks clasping the stem. The small white flowers are arranged in a compound umbel. The fruit is a curved, ribbed, double achene. *All parts of the plant, especially the rootstock, are extremely poisonous.* It is fatal to cattle, hence the name.

Habitat

Cowbane grows throughout northern and central Europe in shallow water, marshes and ditches and similar moist localities. Its stems are sometimes partly floating. It is native to the British Isles, but it has a very local distribution in most parts. Cowbane's aquatic habit and hollow stem distinguish this species from harmless members of the umbellifer (parsely or carrot) family. Nevertheless. Cowbane can still be easily mistaken for celery because the tuber is of the same shape, has a sweet taste and smells like parsely.

Uses

The rhizomes contain poisonous acetylenic compounds and an essential oils that has a narcotic effect but is not toxic. These substances affect the central nervous system and Cowbane was once used for treating various brain disorders and spasms of the smooth muscles. Now-a-days it is usually

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regarded as far too toxic for internal use. *Cowbane should never be collected and used for self-medication.* The poison acts quickly on the nervous system causing salivation, vomiting, abdominal cramps, widely dilated, pupils, delirium and violent convulsions. Death occurs due to paralysis and respiratory failure.

Cinnamomum tamala
(Family: Lauraceae)

Vernacular Names

Sans.–Tamalpatra; *Hind.*– Tejpata (leaves), Dalchini (bark).

Parts Used

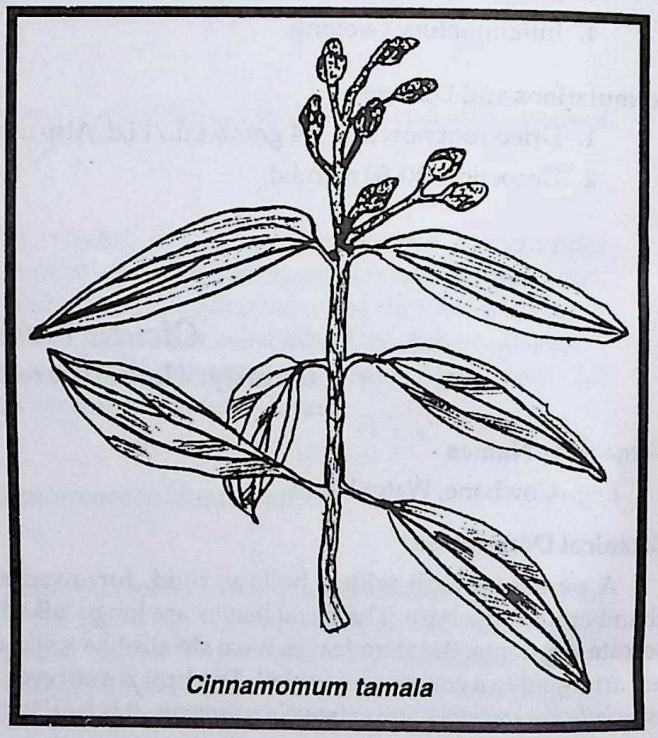
Leaves, bark and oil.

Historical Aspects

C. tamala is an ingredient of Madhvasava described by Charaka many centuries back. As a spice it has been used in India, China. Middle East and Europe and other countries.

Habitat

Grows in tropical and subtropical Himalayas at 1000-2200 m. Also seen in U.P., Eastern Bengal, the Khasi and the Jaintia Hills and Burma.



Cinnamomum tamala

Botanical Description

A moderate sized tree, with a slightly rough bark, dark brown in colour. *Leaves*– opposite or sub-opposite, 5-7.5 by 12.5-20 cm. glabrous and are scaly, shining above. They are 3-nerved from the base to the apex. *Flowers* are small, and unisexual. Perianth lobes are 6, oblong and silky. *Fruit* oblong, dry or slightly fleshy, 13-17 cm. long and dark purple in colour.

Pharmacognosy

The different varieties of bark have been studied for macroscopic and microscopic features.

Phytochemistry

The leaves contain an essential oil, eugenol, terpin and cinnamic aldehyde. Outer bark on distillation yields an essential oil (similar to cinnamomum oil) having a pale yellow colour. Cinnamic aldehyde is the chief constituents. Roots contain an oil which has eugenol, saffrol, benzaldehyde and terpin.

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Ayurvedic Properties

Guna: Pichchila, Laghu, Tikshna; *Rasa*: Madhura; *Veerya*: Ushna; *Vitaka*: Katu, Tikshna; *Dosha*: Kaphavatahara; *Karma*: Rochana. Kandughna, Krimighna, Sangrahi, Kanthya, Artavapravartaka.

Pharmacology

The components of the essential oil have a carminative effect. The beneficient effects of *C. tamala* in patients with diabetes mellitus has been shown. Singh *et al.* report that 20 patients of non insulin dependent diabetes mellitus with polyuria, polydipsia, and polyphagia, were treated with powder of *C. tamala* leaves in the dose of 2 TSF, t.d.s. The response was estimated on the parameters of Joslin's clinic. 50% cases were controlled well, 33.33% fairly so, while 16.67% patients proved refractory. The hypoglycaemic effect of *C. tamala* in patients with maturity onset diabetes (non-insulin dependent) was tested and probed using the parameters on fasting and post-prandial blood sugar. Its role in the management of diabetes mellitus is stressed.

Safety

In clinical trials, as regards to safety, no side effects were reported. *C. tamala* (leaves as well as the bark is used as a spice or condiment and as a flavouring agent for long, without any ill effects being reported.

Clinical Usage

It possesses carminative, astringent and digestive properties and digestive properties and forms an ingredient of many formulations prescribed for gastrointestinal disorders. The drug is diuretic. The oil distilled from leaves is a powerful stimulant. It is used to reduce halitosis.

Indications

1. Flatulent dyspepsia
2. Halitosis
3. Cough
4. Diabetes mellitus.

Formulations and Dosage

1. Trijataka: 250-350 gms b.i.d./t.i.d.

Cissampelos pariera
(Family: Menispermaceae)

Botanical Description

Slender, perennial, glabrous twiner; leaves simple, alternate, exstipulate, long-petioled, orbicular-reniform to reniform-cordate, thin, 4 × 4.5 cms entire, mucronate at tip, pubescent when young; flowers small, greenish, unisexual, male flowers: cymose and female racemed, crowded in the axils of leafy bracts; Male: sepals 4, obovate-oblong, hairy outside; petals 4, connate forming a 4-lobed cup; stamens

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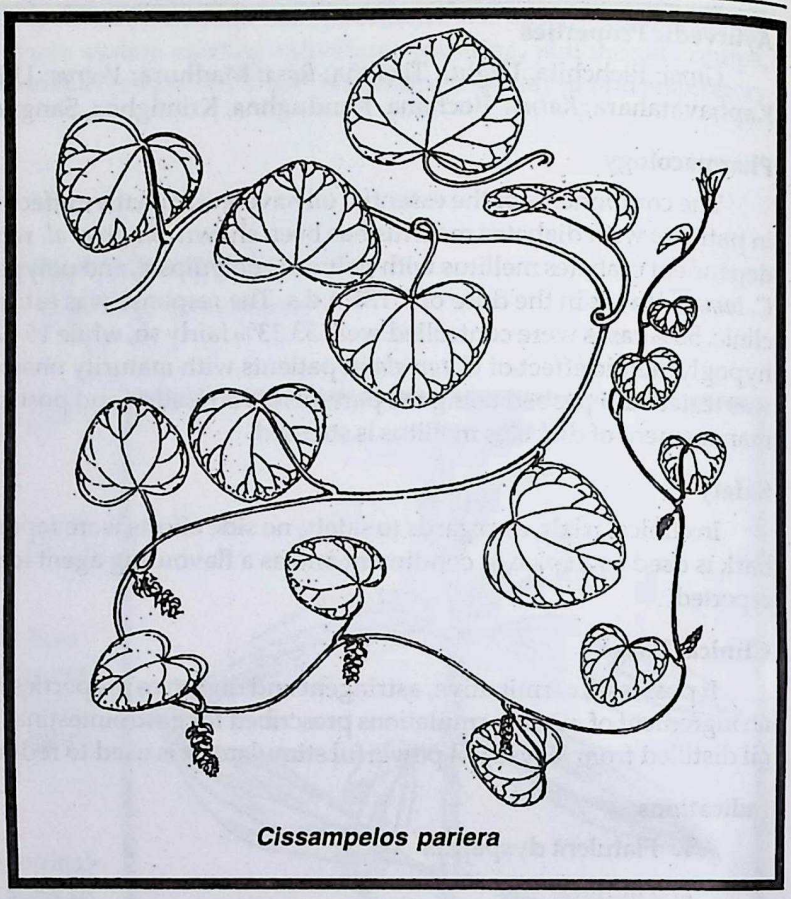
4, connate round the flattened top of the staminal column; female: sepals broadly obovate; petal 1, greenish white; ovary 1, style short ending in a trifid stigma; drupe ovoid.

Habitat

A pantropical species, the plant is common in almost all districts of the tropical and subtropical India.

Uses

The synonyms are indicative of only the properties of the drug. Susruta and Vagbhata mention only one type of *patha* whereas two types are mentioned in *Caraka samhita* and the later *Nighantus*. They are *laghupatha* and *rajapatha*. Almost all the authors equate *patha* or *laghupatha* with *Cissampelos pariera* Linn. of Menispermaceae.



Cissampelos pariera

Cissus quadrangularis, Linn.
(Family: Vitaceae)

Vernacular Names

Sans.–Asti Sandhana; *Hind.*–Hadjod.

Historical Aspects

The plant *Cissus quadrangularis* is a creeper common in the hotter parts of India, used in folklore medicine to heal bone fractures. The Sanskrit name also hints at the same use by ancient physicians.

Botanical Description

The *stems* are leafless when old, quadrangular and ridged. The *flowers* are in short cymes, and the fruit, is a globose berry.

Pharmacognosy

The characteristic features have been well-studied.

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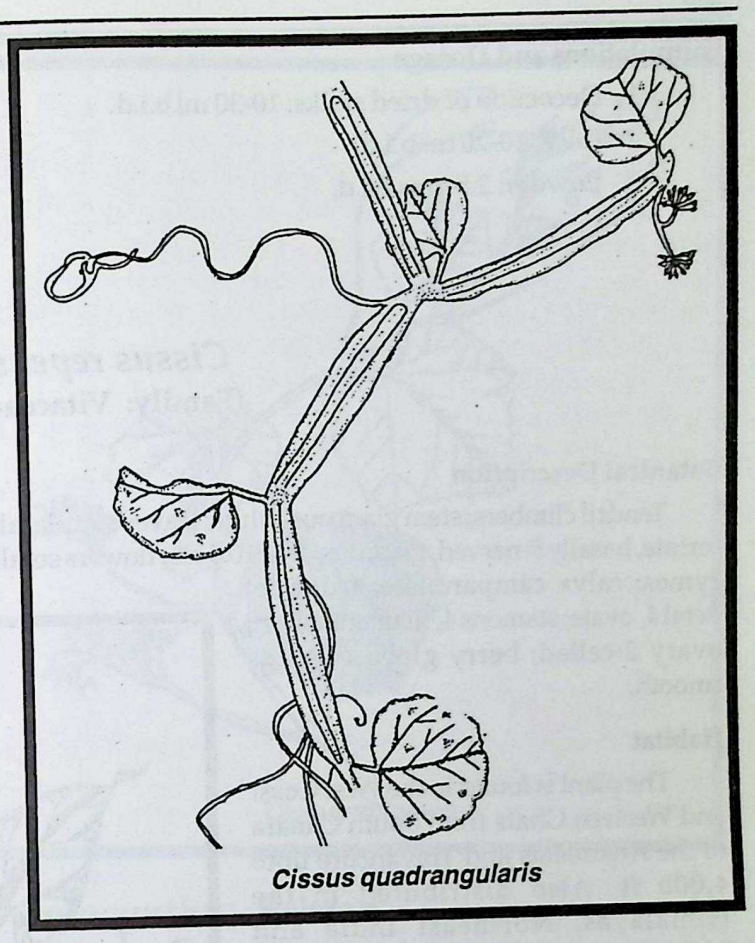

Cissus quadrangularis

Phytochemistry

From the plant stems, 3-ketosteroids have been isolated. Two unsymmetric tetracyclic triterpenoids, sitosterol, α-amyrin and β-amyrene have also been isolated. The steroid contained in this plant has an anabolic property.

Ayurvedic Properties

Guna: Laghu, Ruksha; *Rasa*: Madhura; *Veerya*: Ushna; *Dosha*: Vata, Pitta, Kaphagna.

Pharmacology

The water-soluble glycoside has no toxic effects when administered orally to experimental animals. In dogs the glycoside fraction produces dose-dependent hypotension. This effect can be countered by administering calcium. The alcoholic extract of the plant (containing resins and sterols) displays cholinergic activity on isolated intestine and uterus of rabbits and rats. A similar effect has been observed on tracheal and intestinal smooth muscle of the dog. The effect of the plant on the healing of fractures has been extensively studied by Udupa and Prasad and by others. The anabolic phytosteroid has been shown to markedly induce an early regeneration of the connective tissue and rapid mineralization of the callus. This steroid fraction has androgenic properties and increases the weight of the testes in animals. The extract when administered either intramuscularly or locally, reduces the healing time of fractures.

Safety

Routine doses are well tolerated.

Clinical Usage

It is used as a digestive. Crushed stems are used a poultice over bone fractures. The powdered stem is mixed with pulses and fried in sesame oil, as a remedy for several vata diseases.

Indications

1. Fractures
2. Dyspepsia
3. General weakness

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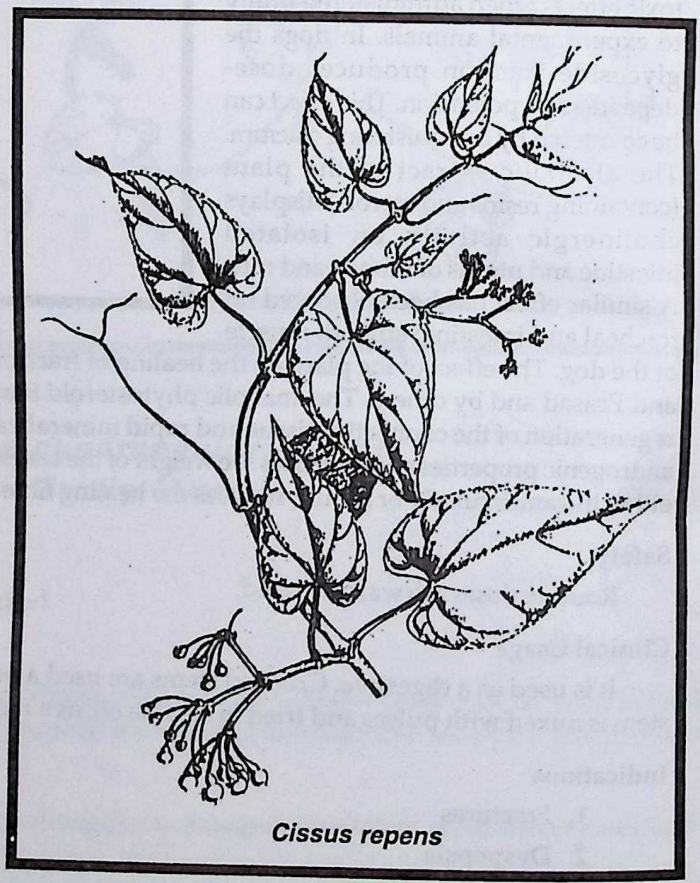
Formulations and Dosage

1. Decoction of dried stalks: 10-30 ml b.i.d.
2. Juice: 10-20 ml b.i.d.
3. Powder: 2.5 gms b.i.d.

Cissus repens
(Family: Vitaceae)

Botanical Description

Tendril climbers; stem glaucous-white; leaves simple, alternate, ovate-acuminate, cordate at base, serrate, basally 5-nerved, glabrous, 15 × 10.3 cm; flowers small, greenish-pink in leaf-opposed umbellate cymes; calyx campanulate, truncate; petal 4, ovate; stamens 4, filaments short; ovary 2-celled; berry globose; seeds smooth.



Cissus repens

Habitat

The plant is found in the West Coast and Western Ghats from South Canara to the Anamalais and Travancore upto 4,000 ft. Also distributed in the Himalayas, Northeast India and Malaysia.

Uses

Amlavitasa is included in the group of fruit drugs (*phalavarga*) by Caraka. The fruit is antiscorbutic, astringent, carminative, cardiotonic, cooling, emollient and is used in anorexia, colic, dyspepsia, heart diseases, piles, difficult micturition, skin diseases, thirst and ulcers. It overcomes diseases due to *kapha* and *vata*, loss of appetite, indigestion, flatulence, liver and spleen diseases, cough and other respiratory disorders. The drug enters into the composition of preparations like *Pancamlatailam, Hinguvacadi curnam, Putikaranjasawam, Abhrabhasmam* etc.

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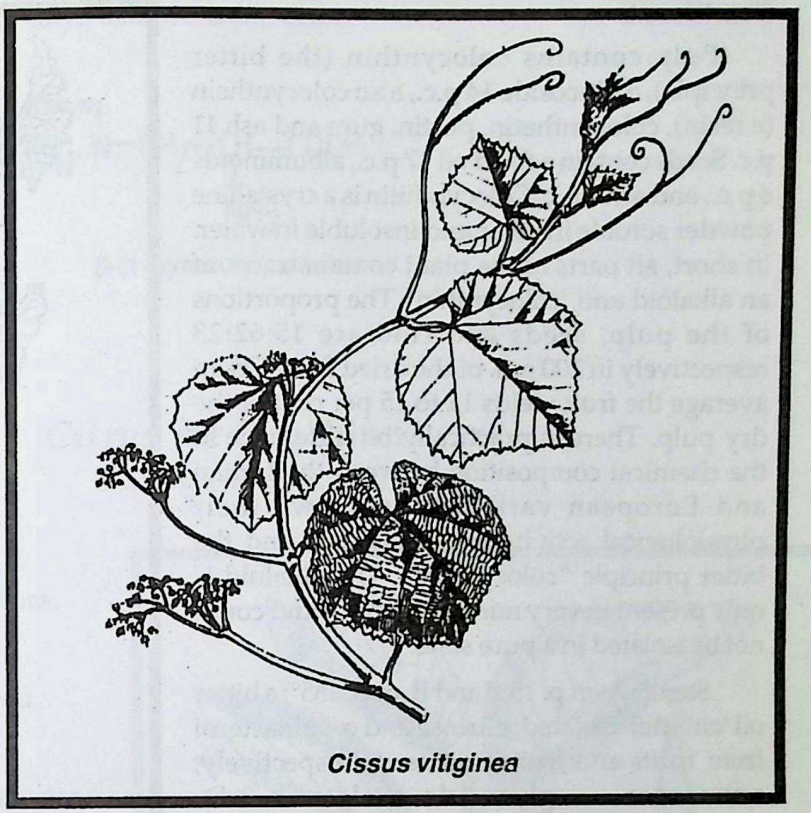
Cissus vitiginea
(Family: Vitaceae)


Cissus vitiginea

Botanical Description

Tendril climber; stem and petioles soft-tomentose; leaves simple, alternate, broadly ovate-cordate, 5-angled, to 12 × 13.3 cm, basally 3-nerved, margin dentate, pubescent; tendrils simple, opposite to leaves; flowers pale yellow in umbellate cymes; calyx tube obscurely lobed; petals 4, ovate; stamens 4, ovary 2-celled; berries blue, pyriform, rugose; seeds tessellate.

Habitat

Peninsular India and Sri Lanka.

Citrullus colocynthis, Schrad.
(Family: Cucurbitaceae)

Vernacular Names

Sans. & Can.–Indravaruni, Vishala, Chitrapala; *Eng.*–Colocynth, Indian wild gourd or bitter apple, bitter cucumber; *Bom., Duk., Hind., Guj. & Ben.*–Indrayan, Makhal; *Tel.*–Eti-puchcha, Verri-puchcha, Chitti-papara, Paperabudama; *Tam.*–Paedikari Attu-tummatti, Peyt-tumatti, Paycumuti, Pekkommatti, Vasi-tummatti; *Mal.*–Paikummatti, Katuvelleri; *Kon.*–Kavandali; *Punj.*–Ghurumba, Tumbi; *Mah.*–Kadu-indravani, Kuru-vrandawan. *Can.*–Hamekkae, Hava, Mekke-kayi, Hara-mekki-kayi; *Arab.*–Hanzal, Hanzul, Aulqam; *Burm.*–Kaya-si; *Sinh.*–Yekka-madu; *Pers.*–Kavistetalkh, Kharbuza-talkt.

Habitat

Common weed found wild in the sandy lands of North-West, the Punjab, Sind, Central and Southern India, and on the Coromandal Coast. Colocynth is not systematically grown anywhere in India.

Parts Used

Fruit deprived of its rind, root, dried pulp of the fruit freed from seeds; oil from seeds.

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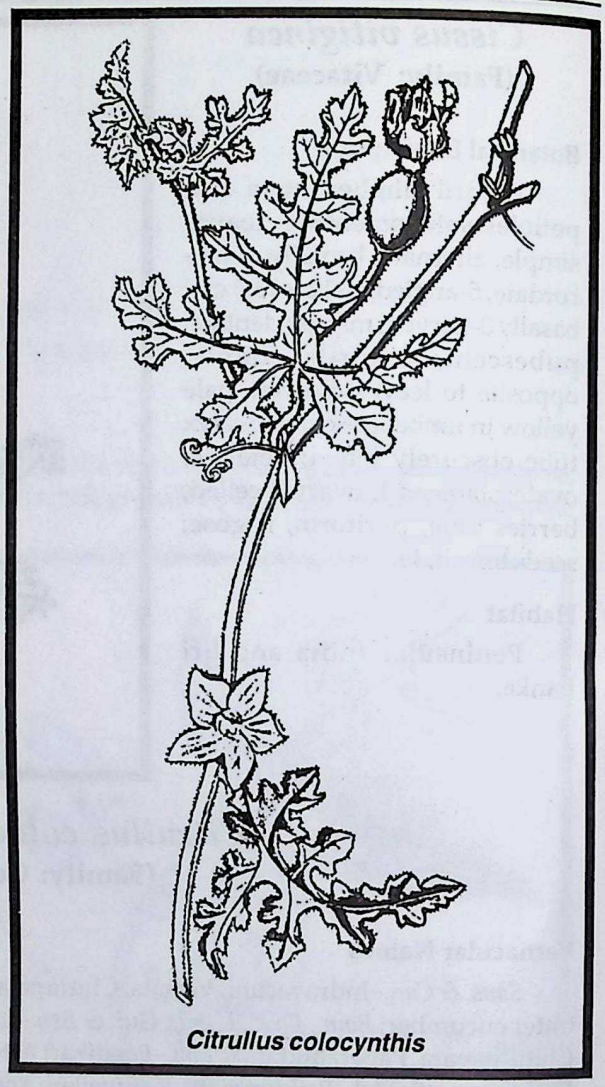
Constituents

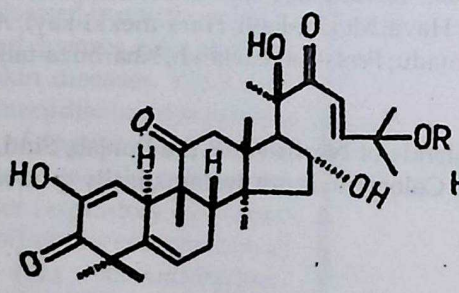
Pulp contains colocynthin (the bitter principle), a glucoside 14 p.c., also colocynthein (a resin), colocynthetin, pectin, gum and ash 11 p.c. Seeds contain a fixed oil 17 p.c., albuminoids 6 p.c., and ash 3 p.c. Colocynthitin is a crystalline powder soluble in ether and insoluble in water. In short, all parts of the plant contain traces of an alkaloid and 'colocynthin'. The proportions of the pulp, seeds and rind are 15:62:23 respectively in 100 gm. of the dried fruit. On an average the fruit yields 12 to 15 per cent of the dry pulp. There is practically no difference in the chemical composition between the Indian and European varieties; both owe their physiological activity to the alkaloid and the bitter principle "colocynthin". The alkaloid is only present in very minute quantity and could not be isolated in a pure state.

Sterols A, m.p. 153° and B, m.p. 265°; a bitter oil 'citbittol' isolated; glucose and α-spinasterol from fruits and fruits and seeds respectively; anticancer glycoside–α-elaterin-2-D-glucopyranoside–in addition to α-elaterin (cucurbitacin E) and citrullol from pulp; glycosides in fruit composed of elaterin, elatericin B (cucurbitacin I) and dihydroelatericin B (cucurbitacin L); a new substance from unripe fruit.

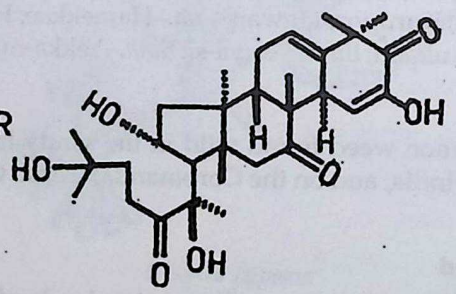


Citrullus colocynthis

New Compounds



α-Elaterin
R = Ac
Elaterin B
R = H



Dihydroelatericin B

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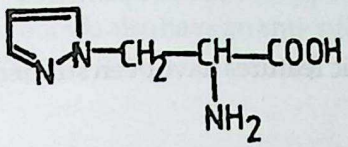
A new amino acid–β-(1-pyrazolyl) alanine–from seeds.

New Compounds



β-(1-pyrazolyl) alanine

Citrus medica, Linn.

(Family: Rutaceae)

Vernacular Names

Sans.–Matulunga; *Hind.*–Bijora.

Parts Used

Root, flowers, fruit, juice seed.

Historical Aspects

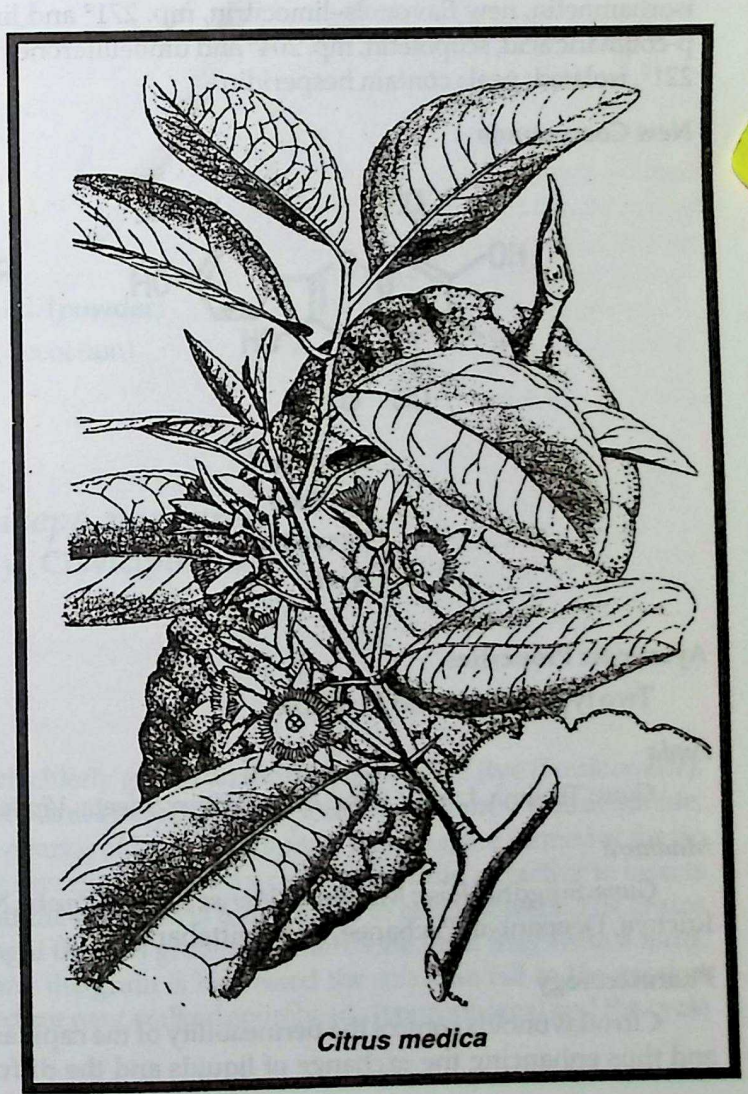
This plant has been commented upon both by Charaka and Sushruta, with reference to its properties and uses in Ayurveda. Many references to citrus are found in ancient Chinese manuscripts, the earliest being in the book 'Yu Kung' or 'Tribute to Yu' dated 2000 B.C. In Europe, the Greeks found the citrus growing in Medea and Persia. The plant is considered indigenous to India, although Malaya also had known the fruit from antiquity. The specific variety–Matulunga–has been associated with one of four goddesses–Padmavati–in India.

Habitat

It grows wild in warm valleys of Himalaya and is cultivated in warm moist areas.

Botanical Description

Shrubs or trees are perennial. *Leaflets* 7.5-15 cm. long, oblong, glabrous.



Citrus medica

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Petiole short marginated. *Flowers* numerous, raceme white or often tinged with pink frequently unisexual. *Fruit*, large oblong or obovoid and rind usually whorled and thick, known as hesperidium.

Pharmacognosy

The macroscopic and microscopic features have been studied.

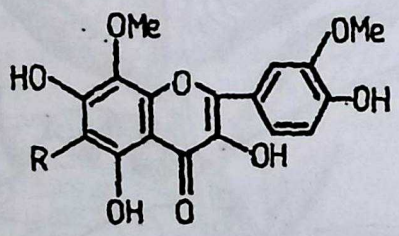
Phytochemistry

The peel contains citroflavonoids consisting of a mixture of hesperidoside (rhamnoglucoside of hesperetol), naringoside and eryodictyoside (flavonones). Essential oils and Vitamin C are also found. Glucosides hesperidin (Vitamin P) and rutin are also present. Some varieties contain the flavonoid naringin. The teriterpenoids *e.g.* limonin gives the intensely bitter taste to some citrus species.

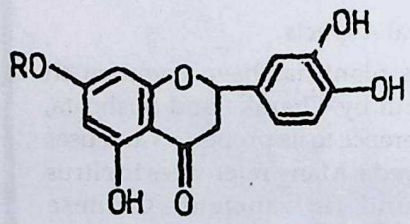
Constituents

Eriocitrin (7-eriodictyol-β-rutinoside) isolated from peel; eriodictyol prepared by hydrolysis of crude mixture of glycosides with hemicellulase; apigenin, luteolin, chrysoseriol, mp. 325°, quercetin, isorhamnetin, new flavonols–limocitrin, mp. 271° and limocitrol, mp. 221°–sinapic acid, mp. 192°, p-coumaric acid, scopoletin, mp. 204° and umbelliferone from peels; limocitrol and isolimocitrol, mp. 221°, isolated; peels contain hesperidin.

New Compounds



Limocitrol
R = OMe
Limocitrin
R = H



Eriocitrin
R = Rutinose

Ayurvedic Properties

Two types–Amla and Madhura

Amla

Guna: Tikshna, Laghu. *Rasa*: Amla. *Veerya*: Sheeta. *Vipaka*: Amla. *Dosha*: Sheeta, Kaphavatashamaka.

Madhura

Guna: Snigdha. *Rasa*: Madhura. *Veerya*: Sheeta. *Vipaka*: Madhura. *Dosha*: Vatapittashamaka. *Karma*: Ruchya, Deepaniya, Pachanee, Raktapittahara.

Pharmacology

Citroflavonoids control the permeability of the capillaries by decreasing the porosity of the walls and thus enhancing the exchange of liquids and the diffusion of proteins. The mechanism for this

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phenomenon is complex, and includes the protective action of diphenols on catecholamines participating in vascular integrity. When capillary resistance is lessened citroflavonoids can prevent bleeding in hypertensive or diabetic patients (diabetic retinopathy) or in purpura, and where there is tendency to haematoma. The citroflavonoids also have an anti-inflammatory, antihistamine and diuretic action and can cause dilatation of the coronaries.

Safety

No untoward reactions have been reported with the standard doses of the formulations.

Clinical Usage

Due to their effect on capillary permeability they are used in modern medical practice in diseases where permeability is increased (varicose veins, haemorrhoids, capillaritis) and in oedema, and ascitis in cirrhosis. They also prevent excessive bleeding. In ayurvedic practice, the dried rind or citrus juice is used in *kapha* and *vata* diseases, as a vermifuge, for asthma and digestive disorders, as an anti-scorbutic. It is used to counteract nausea and to increase appetite.

Indications

1. Anorexia and nausea
2. Capillary bleeding
3. Dysmenorrhoea

Formulations and Dosage

1. Matulungadi Kalka: 10 gm b.i.d.
2. Matulungadi churna: 1.5–3 gm b.i.d. (powder)
3. Matulungadi kwath: 15 ml b.i.d. (decoction)

Claviceps purpurea
(Family: Clavicipitaceae)

Vernacular Name

Eng.–Ergot Fungus

Botanical Description

A spore-bearing parasitic fungus which chiefly grows on the ears (spikes) of Rye (*Secale cereale*). Wind carries the spores to the flowering host plant. There they grow into a mycelium, a web of minute, tubular threads (hyphae) that penetrate the ovaries of Rye. Small spores (conidia) are formed at the tip of specialized hyphae. At the same time the mycelium secretes a clear sweet fluid attractive to insects on the surface of the rye grains or seeds and the infection is transmitted to other flowers. The grains attacked by the fungus atrophy as the fungal threads grow and intertwine until they form a hard, black, club-shaped mass (sclerotium). When the grain is harvested the sclerotia fall to the ground where in early spring they germinate to produce new, stalked sporeheads (sporophores) and the cycle of infection starts again.

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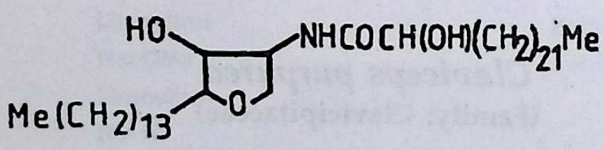
The name Ergot is derived from the old French word *argot* (= a cock's spur), a reference to the appearance of the fungus. Flour made from Rye infected with Ergot has been the cause of episodes of mass poisoning (ergotism) in the past. Symptoms were convulsions and hallucinations along with burning pains and gangrene in the hands and feet. In the Middle Ages the disease was known as St. Anthony's Fire. Ergot is an irreplaceable raw material for many important medicines. Nowadays it is obtained by artificial cultivation on Rye and also by cultivation of the mycelia in fermentation vats. There are strict regulations in Britain for keeping the fungus out of the country and it is now uncommon in cereal crops.

Ergot contains more than a dozen potent alkaloids, most of them derivatives of lysergic acid, among them ergometrine, ergocitrine, ergocornine, ergotamine and ergotoxin. Ergometrine is the most important of these substances. It is extracted and used in pharmaceutical preparations principally to assist women in childbirth and in the treatment of migraine. Ergotamine is also used to treat migraine. *These medicines are available only on prescription.*

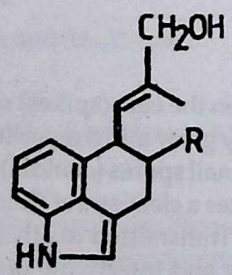
Constituents

Endocrocin (1,6,8-trihydroxy-2-carboxy-3-methylanthraquinone) and clavorubin from ergot and synthesis of former; synthesis and stereochemistry of ergotamine; chrysergonic acid found to be identical with secalonic acid, m.p. 268°; secalonic acid separated into diastereomeric secalonic acids A and B; isolation of ergochrysins A and B, ergoflavin, ergoflavinic acid and secalonic acids B and C; chemical studies on secalonic acids A and B; chemical studies on secalonic acids A and B, ergoflavin and other ergochromes; constitution of ergoflavin and its crystal structure; hydroergotamine, ergotamine, ergosine, dihydroergocristine, dihydroergocornine, dihydroergocryptine, ergocristine, ergocornine, ergocryptine were separated and analysed by PC; chanoclavine, m.p. 174° and isochanoclavine, m.p. 222°, isolated; a new ergocerebrin and a known cerebrin from ergot residues; chemical studies on ergochrysin A, secalonic acids A and B.

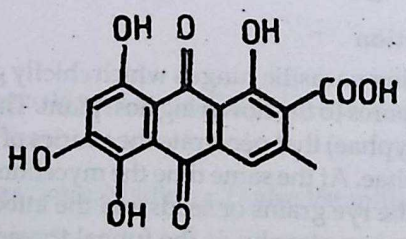
New Compounds



Ergocerebrin



Chanoclavine
R = α-NHMe
Isochanoclavine
R = β-NHMe



Clavorubin

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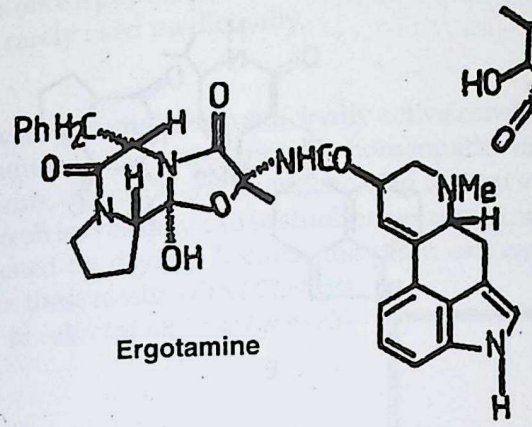
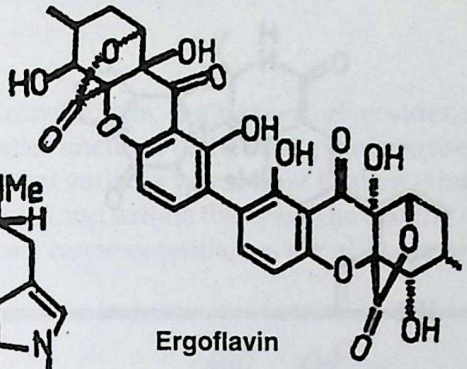
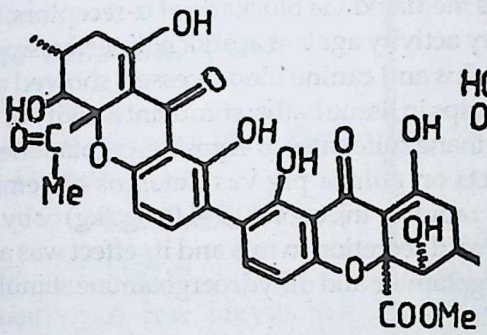


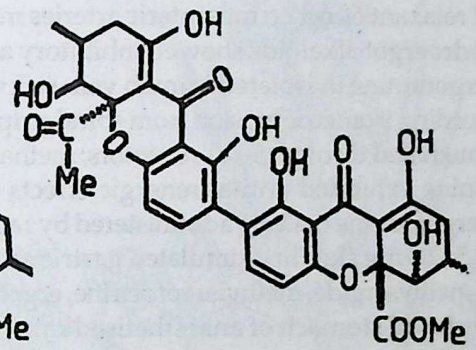
Ergotamine



Ergoflavin



Secalonic acid A



Secalonic acid B

Biological Activity

Administration of 1 mg/kg ergometrine to rats resulted in biliary excretion of 2 metabolites-β-glucuronides of l2-hydroxyergometrine and 12-hydroxyergometrinine–which were more polar than ergometrine. Similar results were obtained on administration of lysergic acid diethylamide.

Ergostine showed only 15% of the activity of ergotamine on rabbit uterus. Inhibition by ergostine of the effect of adrenaline on isolated guinea pig seminal vesicle was three times that of ergotamine. LD_{50} of ergotamine was 3.5 mg/kg and that of ergostine 1.5 mg/kg i.v. in rabbits; pharmacological properties and uses of ergot alkaloids.

Ergotamine and other alkaloids having peptide structure isolated; a process developed for extraction of ergotamine and ergotoxine in 70.0% yield; synthesis of 6,7-secoagroclavine; two new alkaloids–N-(p-lysergyl-L-valyl)-cyclo(L-valyl-p-prolyl) (I) and N-(D-lysergyl-L-valyl)cyclo(L-leucyl-D-prolyl) (II)–isolated from Czechoslovak field ergot and characterised; total synthesis of lysergene and agroclavine; synthesis of elymoclavine and isolysergol; costaclavine and epicostaclavine were shown to be trans-gauch and gauch-trans stereoisomers of dimethylergoline.

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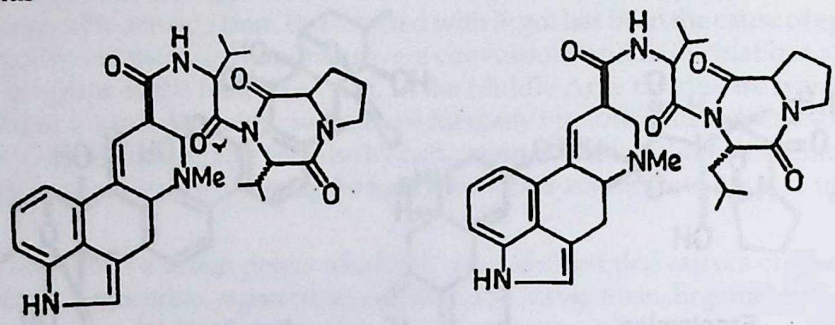
New Compounds



I II

Ergotamine tartrate induced long-lasting contractions in isolated human mesenteric and crural veins, but had relaxant effect on mesenteric arteries mediated via blockade of α-receptors; ergotamine and 9, 10-dihydroergot alkaloids showed inhibitory activity against acetylcholinesterase; ergotamine and dihydroergotamine in isolated human vein strips and canine blood vessels showed antagonism to 5-HT by recording isometric tension from spiral strips in tissue baths; stimulant activity of ergotamine is apparently mediated through 5-HT receptors; methane sulfonates of ergosine, ergotamine, ergosinine and ergotaminine exhibited anti-adrenergic effects on guinea pig vas deferens or seminal vesicle preparations; ergometrine maleate administered by rapid i.v. injection (0.5–4.0 mg/kg) or by continuous i.v. infusion (0.5–2.0 mg/kg/hr) stimulated gastric acid secretion in rats and its effect was antagonised by cimetidine; methysergide, methylergometrine, ergotamine and dihydroergotamine stimulated gastric secretion in perfused stomach of anaesthetised rats.

Clematis recta

(Family: Ranunculaceae)

Vernacular Name

Eng.–Erect Clematis.

Botanical Description

A perennial with a hollow, erect (not climbing or twining) stem, hairy in the upper part. The basal leaves are entire; the stem leaves are opposite and pinnate. The numerous fragrant, white flowers with conspicuous yellow anthers are arranged in dichasiums which grow from leaf axils. The fruit is an achene with a persistent, long, feathery style (plume). *All parts of the plant are poisonous.*

Habitat

A native of central, eastern and southern Europe, but not the British Isles, Erect Clematis grows in woodland margins, thickets, hedgerows and dry bushy slopes, chiefly in warmer regions. It is grown in gardens. The generic name, *Clematis*, is derived from the Greek word *klema* (= vine branch) because many species in the genus are climbing plants. The specific epithet, *recta*, means 'upright'. Erect

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Clematis was once a popular herb for treating venereal diseases, gout, rheumatism and bone diseases but it is now rarely used medicinally.

Uses

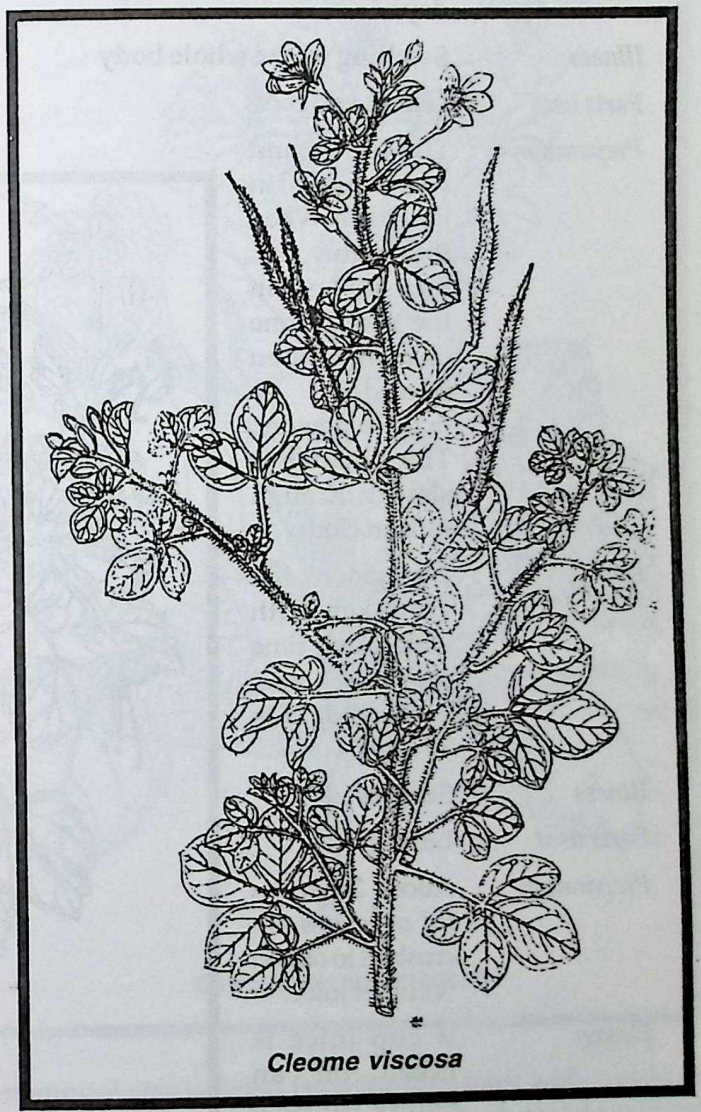
The flowering stems have medicinally active constituents, among them glycosides, saponins and other, so far unidentified, substances. In homeopathy tinctures of the fresh plant are used to alleviate rheumatic pains, migraine and headache, and to treat varicose veins, slow-healing wounds and skin ulcers. The fresh leaves may cause stubborn eczemas and irritate the eyes. The toxicity of the plant is slightly lessened by drying. If eaten the plant can cause enteritis, severe abdominal cramps and diarrhoea. For these reasons *Erect Clematis should never be collected and used for self-medication.*

Cleome viscosa, Linn.

Vernacular Names

Eng.–Cleome viscosa; Mar.–Pivli tiivan; *Hind.*–Hurhur

Illness	:	**Headache**
Parts used	:	Leaves
Preparation	:	A few leaves are crushed and the juice squeezed out.
Dosage	:	1 or 3 drops are put into one nostril, once a day for 2 days.
Illness	:	**Wound**
Parts used	:	Leaves
Preparation	:	A fistful of leaves are ground to make a fine paste. Fresh paste is prepared each day.
Dosage	:	The paste is applied to the wound in the morning and evening for 3 days.



Cleome viscosa

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Clerodendron phlomidis, Linn.

Vernacular Names

Mar.–Airan, *Hind.*–Arni

Illness : **Pain in the chest**

Parts used : Leaves

Preparation : 3 handsful of leaves are steamed.

Dosage : At bed-time, the leaves when warm are tied on the chest. This is repeated for 8 days.

Illness : **Swelling on the whole body**

Parts used : Leaves and roots

Preparation : The leaves and roots are dried in the shade. When thoroughly dry, they are kept in the sun for one day and then pounded to make a powder. The powder is sieved through muslin cloth.

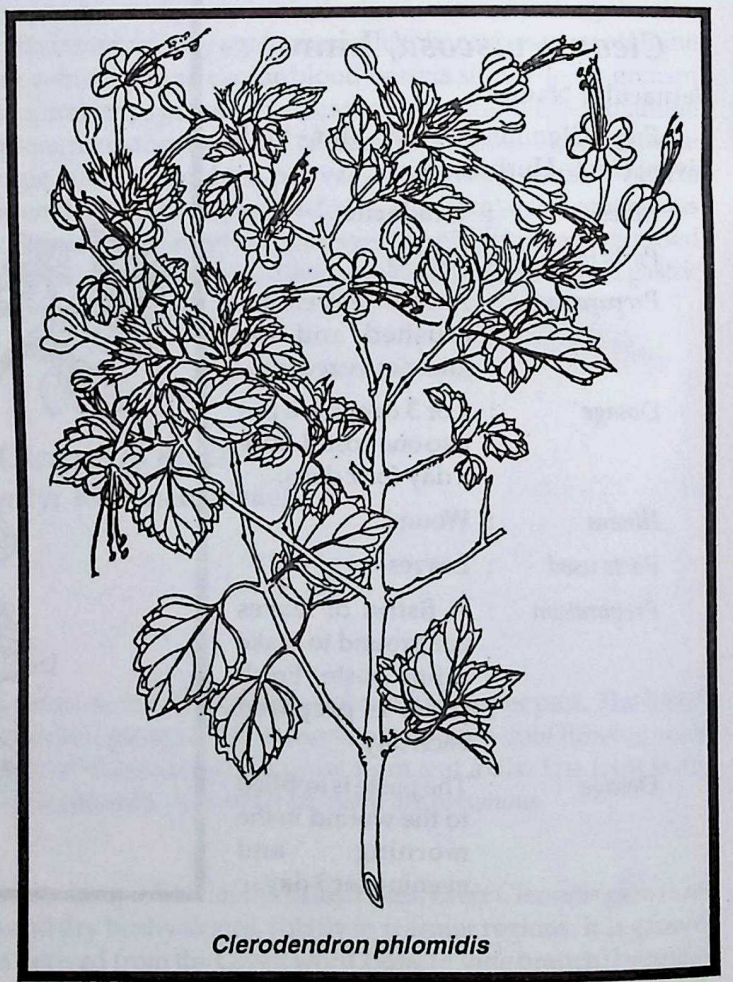
Dosage : 2 teaspoons full are taken with water each time morning and evening for 15 to 20 days.

Illness : **Scabies**

Parts used : Leaves

Preparation : About 2 handsful of leaves are crushed to obtain ¼ cup of juice.

Dosage : ¼ cup juice is taken on an empty stomach in the morning just once.



Clerodendron phlomidis

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Clerodendrum serratum, (Linn.) Moon
(Family: Verbenaceae)

Vernacular Names

Sans.–Bhriguja; *Hind.*–Bharangi.

Parts Used

Roots, leaves.

Historical Aspects

The Sanskrit name of the plant implies a relation of the plant with the great sage Bhrigu. Sushruta and Bhavamisra have also described the medicinal properties of the plant-particularly for respiratory complaints *viz.* asthma.

Habitat

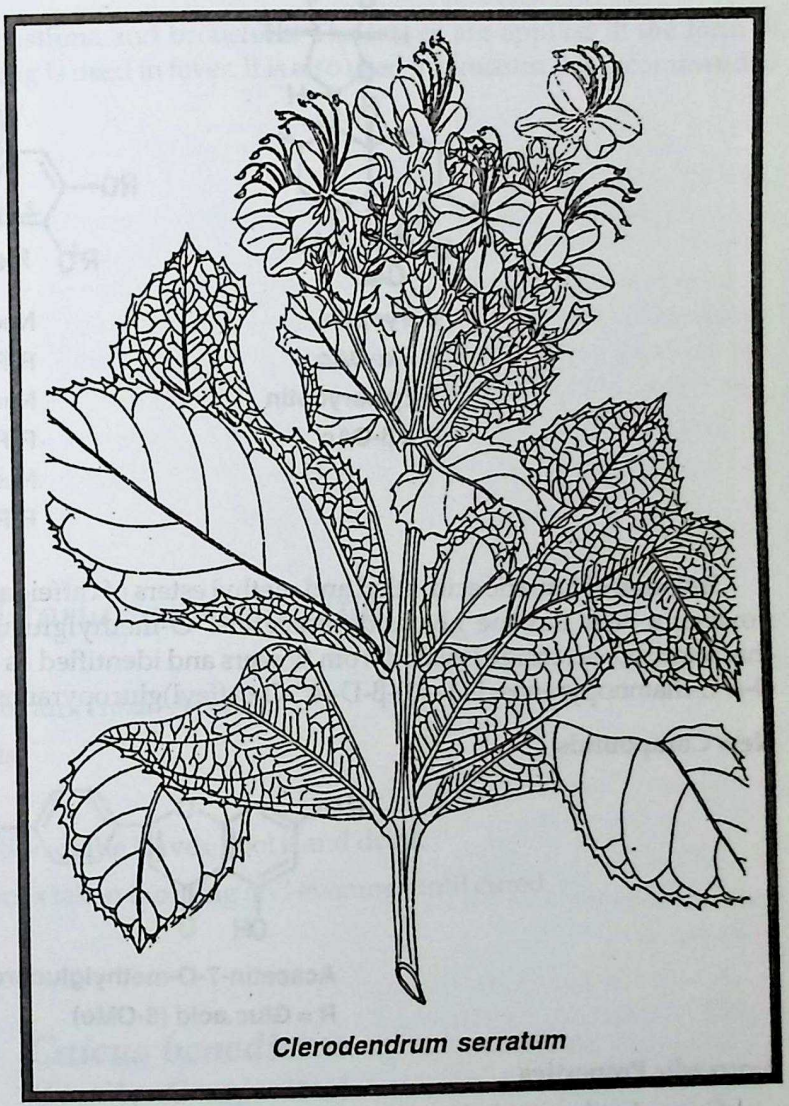
It grows widely in India and is very commonly found in East and South India.

Botanical Description

A shrub 0.9–2.4 m high, slightly woody, not very branched, *stems* bluntly quadrangular, young parts, usually glabrous. It has pink white *flowers*, numerous and striking.

Pharmacognosy

A detailed macroscopic and microscopic characterization of the root and leaf have been made. A comparative study also has been done of the roots of *C. serratum* and *C. indicum* for differentiation.



Clerodendrum serratum

Phytochemistry

A sterolglucoside has been isolated. The root bark yields a glycosidic material, phenolic in nature. D-mannitol was isolated from the root bark with a yield of 10.90%. The powdered stem contains D-mannitol, β-D glucoside of β-sitosterol, β-sitosterol and cetyl alcohol. From the bark the sapogenin mixture contains three major triterpenoid constituents-oleonolic acid, queretaroic acid and serratagenic acid.

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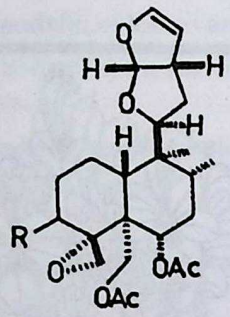
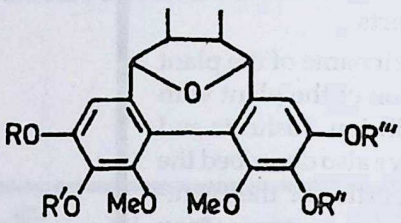
Constituents

Absolute configuration of clerodin, caryoptin and 3-epicaryoptin determined by X-ray studies; three neolignans (I, II and III) isolated from seeds and their structures elucidated by X-ray analysis; royleanone and dehydroryleanone, (24S)-ethylcholesta-5,22,25-trien-3β-ol,α-amyrin,β-sitosterol,β-amyrin and betulin isolated from stems.

New Compounds



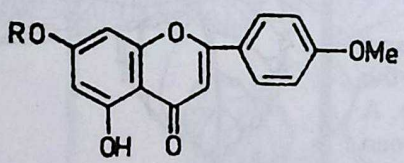
Caryoptin
R = α-OAc
3-Epicaryoptin
R = β-OAc



Neolignan I
R R', R'' R''' = -CH_2-
Neolignan II
R R' = -CH_2-, R'',R''' = Me
Neolignan III
R,R' = Me, R'' R''' = -CH_2-

Isolation of fumaric acid, ethyl and methyl esters of caffeic acid, β-sitosterol and i-glucoside from flowers; a new flavone glycoside acacetin-7-O-methylglucuronate–isolated from flowers and characterised; acteoside isolated from flowers and identified as 2-(3',4'-dihydroxyphenyl)ethanol-1-O-α-L-rhamnopyranosyl-(1→3)-β-D-(4''-O-caffeyl)glucopyranoside.

New Compounds



Acacetin-7-O-methylglucuronate
R = Gluc.acid (6-OMe)

Ayurvedic Properties

Guna. Laghu, Ruksha. *Rasa*: Tikta, Katu, Kashaya. *Veerya*: Ushna. *Vipaka*: Katu. *Dosha*: Kaphavataghna. *Karma:* Deepana, Pachana, Shothahara, Kasaswasahara.

Pharmacology

An aqueous extract produced a graded block of the responses to histamine on isolated guinea pig ileum. It blocked the histamine-induced contractions of the guinea pig tracheal chain preparations without affecting the response to acetylcholine. The saponin isolated from the rook bark caused a release of histamine from rat lung tissue. Continuous daily administration of the plant extract in the

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sensitised guinea pig causes a gradually developing protection against anaphylaxis. The anticholinestrase activity of the saponin was confirmed by acetylcholine responses on guinea pig tracheal chain preparation, isolated rat ileum and frog rectus muscles. The saponin also disrupted the rat peritoneal mast cells and blocked the effect of horse serum antigen.

Safety

In the doses used, no adverse reactions have been reported in man. Larger doses are reactive.

Clinical Usage

A decoction of roots is used in asthma and bronchitis. The leaves are applied ill the form of poultice in skin suppurations. The drug is used in fever. It is also used in sinusitis. It is recommended in inflammations of the eye.

Indications

1. Bronchial asthma, bronchitis.
2. Sinusitis, pharyngitis.
3. Skin inflammation.
4. Diminished appetite.

Formulations and Dosage

1. Churna: 0.5 to 1.5 gm.

Clitoria ternatea, Linn.

Vernacular Names

Eng.–Clitoria Ternatea; *Mar.*–Gokarn; *Hind.*–Aparajit.

Illness	:	*Fever, joint pains*
Parts used	:	Leaves
Preparation	:	Prepare decoction of the leaves, cool it and drink.
Dosage	:	1 cup decoction is taken morning and evening, until cured.

Cnicus benedictus
(Family: Compositae)

Vernacular Name

Eng.–Blessed Thistle.

Botanical Description

An annual herb with a branched, spreading stem. The many alternate stem leaves are toothed or pinnately lobed and spiny and have prominent white veins on the underside. The solitary, terminal

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yellow flowerheads are enveloped by the upper leaves, the involucral bracts ending in downward curving, long, brown bristles. The fruit is a ribbed, yellow-brown achene with a long yellow pappus. All parts of the plant are hairy.

Habitat

Native to the Mediterranean region and neighbouring parts of Asia, Blessed Thistle has been used in Europe since at least the 16th century for treating lung diseases and as a tonic and aperitif. Nowadays the plant is grown commercially for the pharmaceutical industry in some European countries. It is sometimes found as a casual in the British Isles in sunny waste places. Blessed Thistle is said to have acquired its names from its reputation as a cure-all, even for plague.

Uses

The flowering stems and the leaves are used medicinally. The herb gets its bitter taste from the bitter compound cnicin. It also contains traces of an essential oil, tannins, abundant mucilage and minerals. Blessed Thistle has diaphoretic, choleretic, carminative, tonic and antiseptic properties. It is contained in several proprietary medicines and a tincture is used in homeopathy. In herbal medicine small amounts of Blessed Thistle are used to treat digestive disorders and lack of appetite, and to promote the flow of gastric secretions and bile. *Large doses irritate the mouth, digestive tract and kidneys and may cause vomiting and diarrhoea.* Internal use of Blessed Thistle should therefore be professionally supervised. The herb should never be taken during pregnancy.

Blessed Thistle is also used to make bitter liqueurs and was once used in beer making. The tender young shoots can be eaten like artichokes and the leaves can be added to salads.

Coccinia grandis or *Coccinia indica*, Wt. & Arn.

(Family: Cucurbitaceae)

Botanical Description

Slender dioecious climber with tuberous roots; leaves simple, alternate, orbicular-cordate, 3-5 lobed, glabrous, 5 to 10 cm across; flowers unisexual, white, solitary, axillary.

Male: Calyx campanulate, glabrous, lobes 5, subulate; corolla campanulate, 5-lobed; stamens 3, inserted at the base of the calyx tube, flaments connate into a column, glabrous, anthers connate, triplicate, flexuous.

Female: Calyx and corolla as in male; stamens 0; ovary glandular-pubescent, ovules many, stigma 3-partite, fimbriate; staminodes 3, subulate; fruit ovoid or oblong, green with white stripes when young blood-red when ripe; seeds oblong-ovoid, compressed, glandular.

Habitat

The plant is distributed throughout India, common in most plains districts. It has also been reported from tropical parts of Asia, Africa and Australia.

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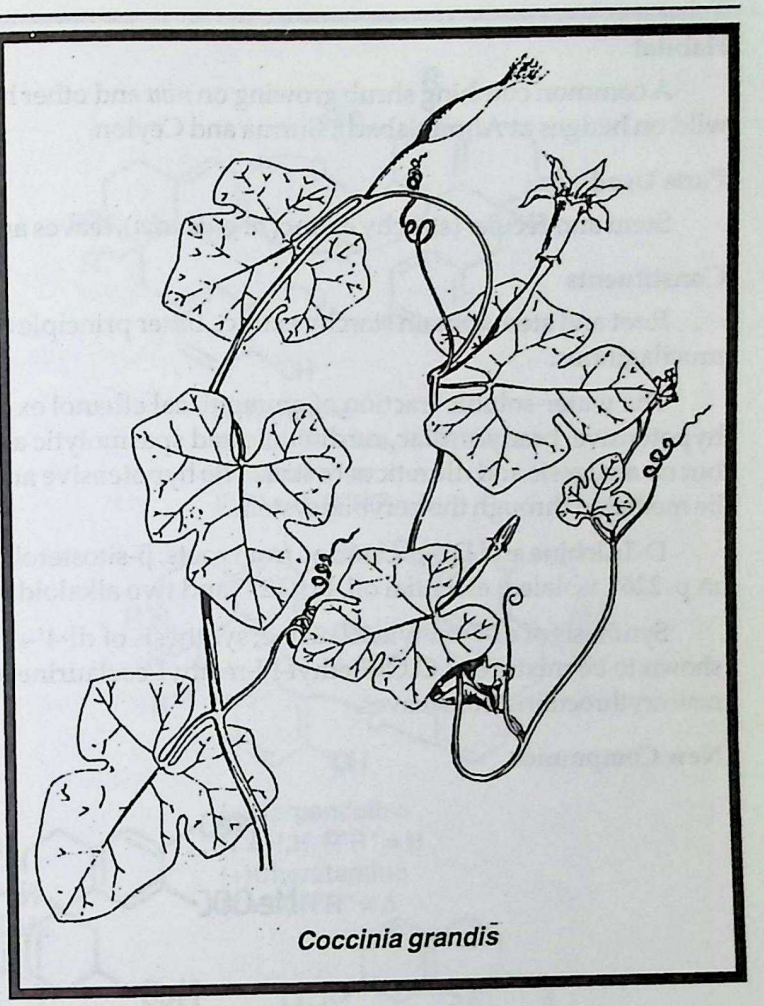
The drug has been found to be effective in the treatment of diabetes mellitus, due to its hypoglycaemic activity. *Coccinia grandis* is very effective in the treatment of infective hepatitis (*mannakkamila*).

Uses

In Indian medicine, *bimbi* is highly valued for its antidiabetic potential. It is carminative, antipyretic, viriligenic, galactagogue and roborant. *Bimbi* overcomes diseases due to vitiated *kapha*, cough, dyspnoea and other respiratory diseases clarifies *pitta* and *rakta*, cures emaciation, fever with burning sensation, diabetes, ulcers and skin diseases. Juice of the plant is given in intermittent glycosuria and enlarged glands. Leaves are applied externally to sores, skin eruptions and bites of animals. Tender fruit is chewed to cure sores on the tongue. The whole plant is used medicinally. In Siddha system of medicine, this drug is used against infective hepatitis. *Vidaryadi ghrtam, Vidaryadi kasayam, Amrtaprasaghrtam, Vastyamayantaka ghrtam* etc. are some of the preparations using the drug.



Coccinia grandis

Cocculus cordifolius

(Family: Menispermaceae)

Vernacular Names

Sans.–Nirjara, Somavalli, Guloochee or Guduchi, Amrita, Pittagni, Bhishakpriya; *Eng.*–Heart-leaved moonseed; *Mah.*–Gulvel; *Hind. & Ben.*–Gulancha; *Bom.*–Ambervel, Giroli; *Duk.*–Gulbel; *Guj.*–Gado; *Punj.*–Gilo Gulanch; *Kash.*–Bekhgillo; *Arab.*–Gulbel; *Gwalior.*–Gudbel; *Tel.*–Tippatega; *Tam.*–Sindilkodi, Amradvalli; *Mal.*–Chittamratam, Paiyamratam; *Can.*–Amratavalli; *Goa.*–Amritvel; *Burm.*–Singo-mone; *Sinh.*–Rasakinda; *Malay.*–Piturali.

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Habitat

A common climbing shrub growing on *nim* and other high trees in tropical Western India (grows wild on hedges at Ahmedabad), Burma and Ceylon.

Parts Used

Stem and fecula: (starchy extract of *gulancha*), leaves and root.

Constituents

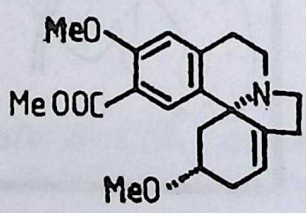
Root and stem contain starchy extract, bitter principle and a trace of berberine. Leaves are highly mucilaginous.

The water-soluble fraction of ammoniacal ethanol extract of stems and roots showed sedative, hypotensive, bradycardiac, cardiotonic and spasmolytic actions. It had slight anticonvulsant action but no analgesic and diuretic activities. The hypotensive and bradycardiac actions were not found to be mediated through the nervous system.

D-Trilobine and DL-coclaurine from roots; β-sitosterol, ginnol and monomethyl ether of inositol, m.p. 226°, isolaled; essential oil, bp. 127° and two alkaloids were also isolated but not characterised.

Synthesis of dl-7-metylcoclaurine; synthesis of dl-4'-methyl-6-demethylcoclaurine; coclanoline shown to be mixture of O,O-diethyl-N-methyl-coclaurine and laudanine; isolation and structure of new erythroculine from leaves.

New Compounds



Erythroculine

Coclaurine, menisarine, sinactine, a trihydroxy compound, β- and γ-sitosterols and a mixture of fatty acids from leaves.

Absolute configuration of sebiferine elaborated by its synthesis; laurifoline and magnoflorine chlorides and O-methylisocorydine, isocorydine are boldine methochlorides isolated; synthesis of laurifonir; four new abnormal erythrina alkaloids–cocculitinine coccudinone, cocculimine and coccudienone–isolated together with isococculidine, isococculine, coccuvine, coccuvinine, cocculitine, coccoline, coccolinine stepharine and sebiferine and their structures and stereochemistry determined; total synthesis of coccoline, isococculidine, coccuvinine and cocculidine; two new erythrina alkaloids–erythlaurine and erythramide, mp. 87°–isolated from leaves and characterised; anion MS of isococculine and other abnormal erythrina alkaloids studied; yield of coclaurine (0.07%) in stems and roots; (+)kohatine, (+)kurramine, (+)norpenduline and cheratamine isolated along with other bisbenzylisoquinolines.

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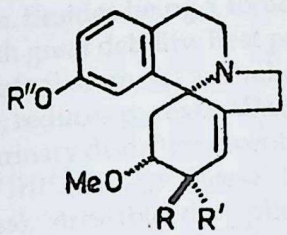
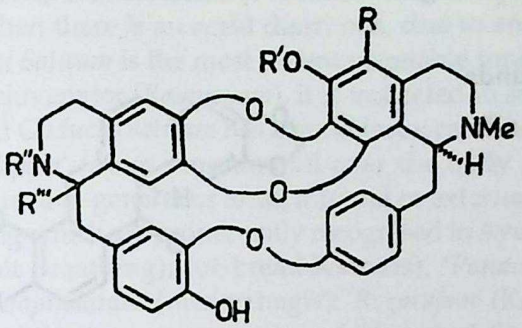
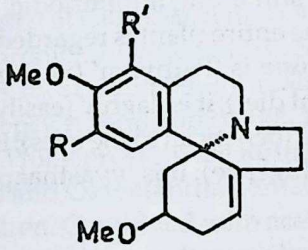
New Compounds



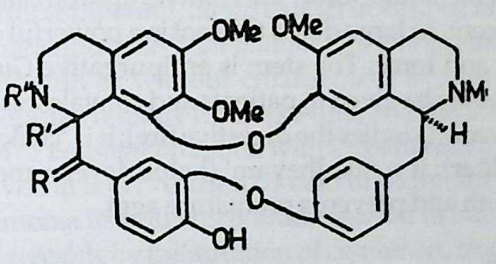
Cocculitinine
R = OH,R',R" = H
Coccudinone
RR' = OR" = Me



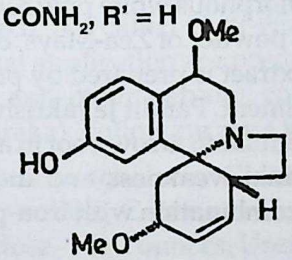
(+)Kohatine
R = OH,R' = Me, R",R"' = H
(+)Kurramine
R,R' = H, R"R"' = Δ



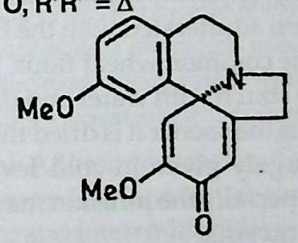
Erythlaurine
R = COOMe, R' = OH
Erythramide
R = $CONH_2$, R' = H



(+)Norpenduline
R = H,H, R'R" = H
(+)Cheratamine
R = O, R'R" = Δ



Cocculimine



Coccudienone

Biological Activity

Isocorydine, O-methylisocorydine and boldine methochlorides exhibited neuromuscular-blocking and hypotensive activities; gross behavioural effects following intracerebroventricular administration of d-coclaurine in mice and on dopamine uptake in mouse iris showed that d-coclaurine (25 µg) inhibited locomotor activity and caused ptosis and catalepsy. Pretreatment with coclaurine suppressed locomotor activation and rotational behaviour induced by apomorphine and methamphetamine. Coclaurine (20 mg/kg, i.v.) suppressed dopamine uptake in mouse iris pretreated with α-methyltyrosine, suggesting neuroleptic-like property of coclaurine in blocking effects of dopaminergic stimulating agents.

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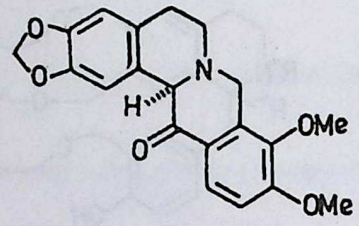
Structure, configuration and synthesis of (+)ophiocarpinone, isolated from stem and leaves, described.

New Compounds



Ophiocarpinone

Action

Stomachic, bitter tonic, alternative, aphrodisiac, hepatic stimulant, antiperiodic, mild diuretic and demulcent. In large doses the root is a powerful emetic. The entire plant is regarded as a valuable alternative and tonic. The stem is antipurgative *Guduchi Satwam* is 'Pathyam' (*i.e.*, agrees with the system and may be given to patients and convalescents as a light diet); it is 'laghu' (easily assimilated); it is 'Deepanam' (kindles the digestive fire); it is 'chakshushyam' (beneficial to the eyes); it is 'dhatukrit' (tissue-builder); it is 'medhayam' (helps development of intelligence); it is 'vyasthaapanakarakam' (retains youth and prevents premature age).

Preparation

Cold infusion (one ounce of the bruised stem infused for four hours in 10 ounces of cold water), *dose*: 1 to 4 ounces. Tincture (1 in 8), does ½ to 2 drachms; starchy extract of fecula; dose 5 to 20 grains. Preciptated extract (*Satwam*) or *Guduchi Satwan* is an amorphous white powder or lumps derived from *Guduchi*. It is often adulterated with the English-made powder of Zea-Mays, our: common corn-flour and also with the common wheat flour. The watery extract is prepared by powdering the stem and washing out the starch with water and drying the sediment. Pandit Jayakrishna Indraji says "that as the deposit settles the sooner it is dried the better. It is similar to arrow-root in appearance." The fecula is nutritious, largely given in cold fevers and seminal weakness and in urinary affections. Its preparations, especially the infusion may be given in combination with iron-preparations, like those of calumba and quassia.

Uses

The entire plant-stem, leaves and root are used in medicine, preferably in the fresh state; the root and stem should be collected in the hot season when the bitter principle is most abundant and concentrated. The creeper from which *Guduchi Satwam* is prepared heads the list of the valuable bitter tonics in Ayurvedic Pharmacopoeia and is the bitterest amongst them. It is a very valuable tonic and is best given in infusion, with or without milk; the tincture and *extract* (*Guduchi Satwam*), which is a starchy matter, is administered in ghee or in sugar and water, or in milk. It is also a valuable nutrient when there is intestinal irritability and inability to digest any kind of food, and is largely used in (indigenous) practice, in cold fevers, seminal weakness and urinary affections; especially the *extract* in 5 to 10 grain doses is useful in general and seminal debility, fever, vomiting, jaundice, torpidity of the liver, skin diseases (patches and small boils on the surface of the skin generally in the extremities often painful and persistent), secondary syphilis, rheumatism, acidity, of urine and urinary diseases (various forms of diabetes), some forms of dyspepsia, irritability of the stomach, splenic affections, chronic

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gonorrhoea, leucorrhoea, chronic diarrhoea, and in some forms of obstinate chronic dysentery. Kirtikar & Basu say that Guduchi is also useful when there is an acrid diarrhoea, due to an acidity of .the intestinal canal or acrid dyspepsia *Guduchi Satwam* is the most potent vegetable tonic food that we have in India. Besides being a tonic and rejuvenator (*Rasayanam*), it is indicated in several diseases attended with great debility. Best prepared *Guduchi Satwam* has a good taste; carelessly prepared is bitter. Yogaratnakaram says it relieves *'Tapam'* (a hot sensation all over the body creating much restlessness); reduces pyrexia; *'Daham'* (burning–general or local; internal or external); *'Meham'* (all varieties of urinary disorders-twenty among which are prominently recognised in Ayurved); *'Aruchi'* (anorexia); *'Trit'* (thirst); *'Swasa'* (difficult breathing); (or breathlessness), *'Pandu'* (anaemia or bloodlessness); *'Aras'* (bleeding piles); *'Raktapradaram'* (menorrhagia): *'Rogarajam'* (King of Diseases *i.e.* consumption). It adjusts and maintains the proper proportion of *'Tridoshas'* thus maintaining health by readjusting any disturbance of the equilibrium of *tridoshas*; relives abnormal uterine (and worst forms of vaginal discharges. It is used as a febrifuge and tonic in gout; combined with extract of chiretta, *Vasaka*, myrobalan, *neem*, picrorhiza, *parpata* (Oldenlandia herbacea) all together being equal in weight to that of *Gulancha*, it makes a very useful compound, liquid extract in various kinds of fevers (high and chronic). *In malaria it is some times more efficacious than quinine.* As compound tincture or infusion it is most valuable in, malarial fevers with or without enlargement of liver and spleen, anaemia, dropsy, hiccup and cough. Root is a popular, remedy for snake-bite; and the *watery extract* is administered for leprosy. In the form of *decoction* or *infusion* combined with Cyperus Rotundus, ginger, sandalwood and Oldenlandia herbacea, it is given in fevers caused by cold or indigestion, especially among children. Combined with acetate of ammonia its infusion is administered in intermittent and other mild forms of fevers. It is rendered more agreeable by the addition of cinnamon, cloves and other aromatics. The dose is 2 to 4 ounces three times a day. *Juice* mixed with powdered long pepper, *pashanbhed* and honey is a common household remedy for gonorrhoea. *Juice* forms one of the ingredients in *poushtiks* given in phthisis. *Watery extract* prepared by Hakims when pure, is white in colour and consists chiefly of starch. It is called "*Satt-gilo* or *Palo*" and is given in chronic fevers and in diabetes. Several *oils* for external application are prepared with *gulancha* and are much used in skin diseases, rheumatic affections and other nervous complaints-*Guduchyadi taila; Vrihat guduchydi taila; Vata Guduchyadi taila* (Charaka). Following are a few very useful preparations containing *Gulancha*:

1. Take of Alstonia scholaris. *Gulancha*, leaves of Adhatoda vasaka, Cyperus rotundus, Trichosanthes dioic, Calamus rotung Catechu, *neem* leaves in equal parts; and prepare a decoction; dose–1 to 2 ounces. Useful in remittent and intermittent fevers.
2. Take of *Gulancha, parpata* (Hedyotis biflora); Cyperus rotundus, chiretta and ginger each 1 drachm and water half a seer. Boil down to one-fourth. Useful in bilious and other fevers which have resisted other antiperiodics.
3. *Dhatreemodaka*–Take of chebulic and emblic myrobalans, ginger, and long pepper each 1 part, watery, extract of *gulancha* (*Guluchi Satwam*) 4 parts, water 16 parts. Boil till reduced to one-fourth and prepare a confection with 8 parts of sugar; when of proper consistence divide the mass into boluses of 1 drachm each. Dose–One bolus taken every morning in chronic fever with enlarged spleen, cough, loss of appetite etc. (Sarakaumudi).
4. Take of leaves of *Gulancha* 4, Oxalis Corniculata 1, Chebulic myrobalan 1, dried ginger 1 and *Pipli* 1 part. Mix and make a decoction in the usual way and then add sufficient quantity of honey. Dose–1 to 2 drachms. Useful in remittent fevers.
5. Take of *Gulancha* 2, Achyranthes aspera 1, Embelia Ribes 3, root of Aplotaxis auriculata 2, Asparagus Racemosus 2, Acorus calamus 3, *Balharda* 4 and Canscora decussata 2 parts.

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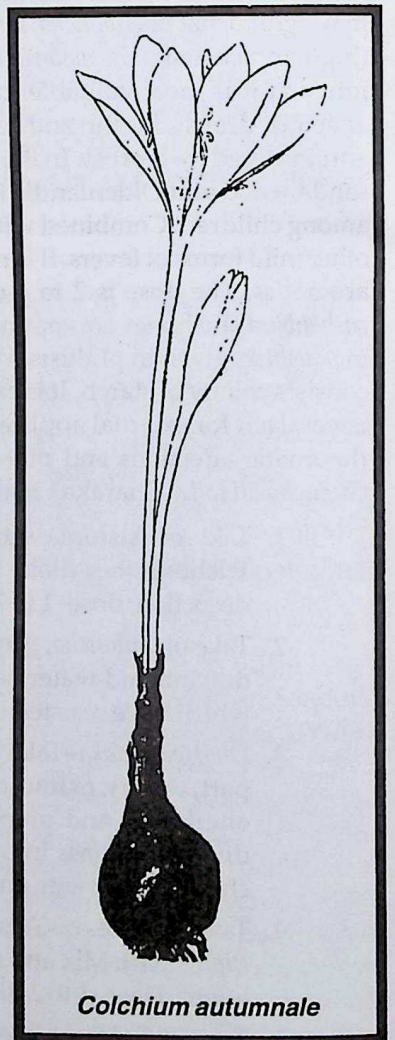
Mix and make a powder. Dose–grains 10 to 15. Used as a blood-purifier; also an alterative tonic in syphilis, scrofula etc.

6. Take of *Guduchi Satwam* ¼ tola, sugar-candy ¼ tola and honey 1 dram, and butter (preferably goat's) sufficient quantity; mix all together. Taken on empty stomach morning and evening (twice a day) is useful in consumption.
7. Take of *Guduchi Satwam* 1/8 tola and fresh cow's ghee ¼ tola. Mix well. Taken morning and evening on empty stomach twice a day, is beneficial in diabetes mellitus.

Colchium autumnale
(Family: Liliaceae)


Colchium autumnale

Vernacular Names

Sans.–Hiranya-tuttha, Tutham, Tuthanjana; *Eng.*–Golden collyrium, Kashmir Hermodactyls; *Vern.*–Surinjan; *Hind.*–Haran Tutiya; *Kash.*–Surinjan.

Botanical Description

A perennial herb with an underground brown, scaly corm which bears solitary, long, violet and tubular crocus-like flowers in the autumn. (It differs from crocuses in having six–not three–stamens.) The orange anthers give the plant one of its common names. After pollination the seeds remain in the ovary until spring when several large, fleshy, bright glossy-green, oblong to lanceolate leaves appear, arranged in a rosette with the fruit–a capsule–in the centre. The small brown seeds are pitted. *All parts of the plant are extremely poisonous.*

Habitat

Afghanistan, Punjab, Kashmir, Northern India, western temperate Himalayas, Chamba and Murree Hills.

Meadow Saffron grows throughout Europe, in some parts in large numbers in damp meadows and pastures. In the British Isles it is rare except in western England. East Anglia and Yorkshire and in woods in the Cotswolds where it remains locally common. The generic name, *Colchicum*, is derived from Colchis, an ancient country in Asia Minor.

Parts Used

Solid extract prepared from the corm or bulbous root, and called Haran-tuttia.

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Constituents

Seeds and roots both of the bitter variety of C. luteum, are found to contain the alkaloid Colchicine in fairly large proportions, readily soluble in water and spirit, decomposing into colchiceine, tannic and gallic acids, starch, sugar, gum, etc. The sweet variety also contains traces of an alkaloid which has been found to be physiologically inactive. *Haran-tutiya* or *Hiranya-tuttha*, a medicine of great repute-a dark-brown dry extract prepared by Afghans and in Northern India out of the bulbous roots (corm) and mainly from the aqueous extract of Colchicum luteum and other species, and sold in small pieces of a dark-brown colour.

The ether extract i.e., alkaloid-containing part, was 1.31 p.c., in bitter '*surinjan*' obtained from Lahore and 0.69 p.c. in sweet '*surinjan*' (Merendera persica) from Persia. The corms of C. luteum have been examined at the Calcutta School of Tropical Medicine and they appear to resemble C. autumnale in their general form. Chemical analysis shows that they contain a large amount of starch, a small quantity of oily resinous matter and a bitter alkaloid. Following the assay methods laid down in the U.S.P., the percentage of the alkaloid in the air-dried corms of C. luteum was found to be from 0.21 to 0.25 and in the seeds from 0.41 to 0.43 p.c. The alkaloid thus obtained has the same properties as that of the official alkaloid Colchicine obtainable from the official C. autumnale. The U.S.P. requires 0.35 p.c. of alkaloid in the corms and 0.45 p.c. in the seeds. No standard, however, has been fixed by the B.P., it is remedy recommended that the seeds should be employed for the preparation of the tincture and the corm for the extract or wine of colchicum. The alkaloid colchicine is liable to be affected by high temperature. The corm should, therefore, be collected early in the summer and dried at a temperature not exceeding 65°C. Attention to this direction may increase the percentage of alkaloid. It would appear from the above analysis that both the corms and the seeds of C. luteum or '*Surinjan-i-talkh*' sold in the Indian market could be used for therapeutic purposes in place of C. autumnale. It may, therefore, be confidently expected that C. luteum will in future be more extensively employed in the preparation of galenicals in India than has hitherto been the practice.

Preparation

Extract, dose ¼ to 1 grain.

Action

Alterative.

Uses

Chiefly used in rheumatism, gout, etc. Colchicum luteum is a very good substitute for the C. *autumnale* which is official in the B.P. There are two species commonly sold in the Indian bazars; one is sweet and the other bitter. The bitter variety is C. luteum or '*Surinjan-I-talkh*' which is distinguished from the sweet variety '*Surinjan-i-shirin*' by its bitter taste, smaller size, darker colour and a reticulated appearance of the corms. The medicinal properties of this plant were well-known to the Arabs. The Kashmir Hermodactyls or '*Surinjan-i-talkh*' was and is still used by the Mohamedan physicians as an alternative and aperient, especially in gout, rheumatism and diseases of the liver and spleen. In gout, it is combined with aloes; with ginger and pepper it is used as an aphrodisiac; a paste is made with saffron and eggs and is applied to rheumatic and other swellings; powdered root is sprinkled on wounds to promote cicatrisation. In Hindu medicine '*Tutham*' or '*Tuttanjana*' is the term applied to a collyrium made of copper sulphate and root of C. luteum. The corm of C. luteum are occasionally adulterated with corms of the sweet variety and another plant viz. Narcissus tazetta belonging to the same nature order, growing abundantly in Persia and which is supposed to have similar properties.

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A variety known as C. speciosum Stev., commonly grows in Badghis and Khorasan and finds its way into India.

The seeds of colchicum are not commonly sold in the Indian bazars.

The corms and seeds are used medicinally. Besides the poisonous alkaloid colchicine, which is found in all parts of the plant, the seeds contain other alkaloids, large amounts of fat, tannins and sugars. Colchicine is extracted and used in preparations prescribed by medical practitioners mainly for acute attacks of gout and rheumatism. Tinctures of Meadow Saffron are used in homeopathy for the same complaints. Demecolcine, a derivative of colchicine, was for a time used in the treatment of chronic leukaemia. *Meadow Saffron is a dangerous plant and it should never be collected and used for self-medication.* If the seeds or flowers are eaten, the outcome is often fatal. Symptoms of poisoning include salivation, vomiting, diarrhoea and abdominal cramps. Convulsions, general paralysis and respiratory failure may follow. The plant is also toxic to animals, particularly when they are fed dry fodder. The alkaloids even pass into milk and can accumulate to reach toxic level. Colchicine inhibits the division of certain cells and this property has been used to produce new plant varieties.

Coleus ambonicus
(Family: Lamiaceae)

Botanical Description

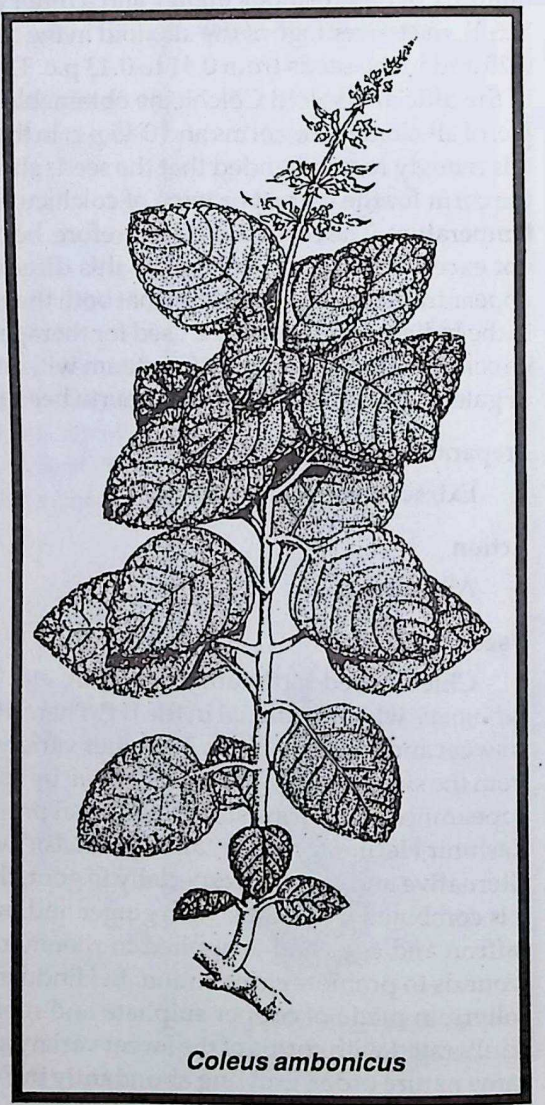
Much branched, fleshy, highly aromatic pubescent herb; leaves simple, opposite, long-petioled, lamina broadly ovate or orbicular-obtuse, crenate-serrate on margin to 9 cm across, fleshy, bullate above; flowers small, purple, in dense whorls at intervals on a terminal racemose axis; calyx 2-lipped, tube decurved, corolla 2-lipped; stamens 4, didynamous; fruit of 4 orbicular nutlets.

Habitat

The plant is a Malay species, cultivated and found run wild. It grows in Circars, Deccan and Carnatic.

Uses

This aromatic plant (*karpuravalli*) with its distinctive smelling leaves (*gandhaparnika*) is a common home remedy for infantile cough, cold and fever. The drug is hot, digestive, carminative, diuretic, anthelmintic and constipating. It overcomes diseases due to *kapha* and *vata*, cures poisonous affections and stimulates the function of lever. It is given in epilepsy and other convulsive affections, kidney and bladder



Coleus ambonicus

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stones, indigestion, diarrhoea, dysentery, cholera and bilious affections. Crushed leaves are used as a local application for headache and to relieve the pain and irritation caused by poisonous bites. Leaves form an ingredient of preparations like *Gopicandanadi gulika*, *Abhram*, *Pulilcham*, etc.

Coleus aromaticus, Benth.

(Family: Labiatae)

Vernacular Names

Sans.–Pashanabhedi, Asmantaka, Himsagar; *Eng.*–Country borage; *Hind.*–Patherchur, Patharcheer, Amroda; *Ben.*–Pathar-kuchi, Amlakuchi; *Tam.*–Kurpurvalli; *Guj.*–Ovapana; *Mah.*–Pan-Ova.

Habitat

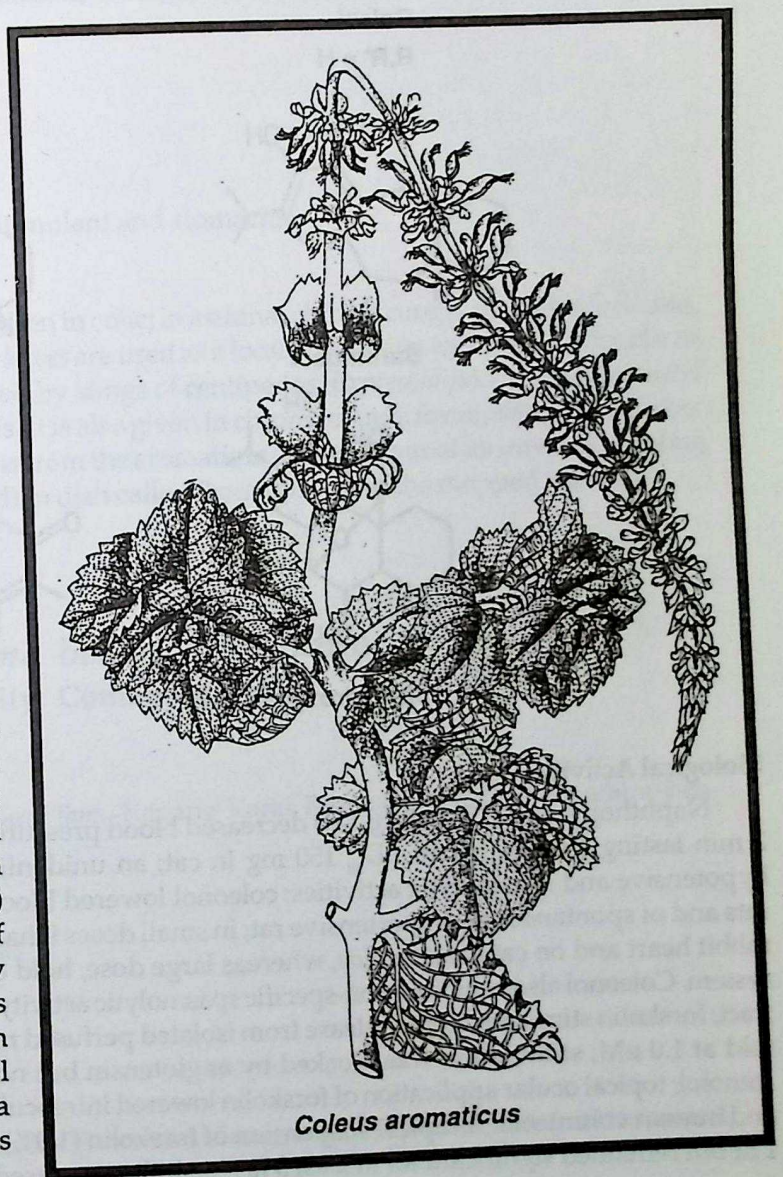
This grassy plant is found or cultivated throughout India, Ceylon and Moluccas.

Parts Used

Leaves

Constituents

Essential oil carvacrol. New diterpenes–coleonol D, coleol and coleonone–isolated from roots and their structures established; coleonol E and F isolated and characterised; coleonol and forskolin, isolated from roots, found to be stereoisomers; detection of forskolin at 0.0001% level by GLC and TLC assay; crocetin dialdehyde (8,8′-diapocarotenedial) isolated from roots; isolation of naphthopyrone from roots; new diterpene–barbatusol–isolated and its structure and absolute configuration established; 6β-hydroxycarnosol isolated and characterised; a diterpenoid–plectrin –isolated and its structure determined.



Coleus aromaticus

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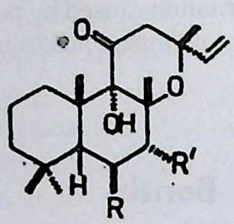
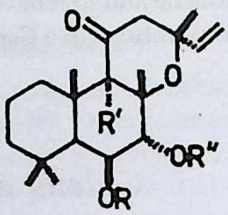
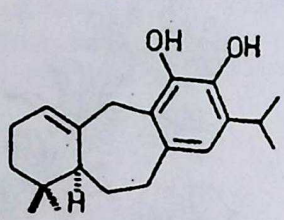
New Compounds



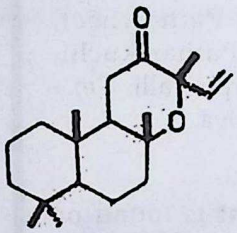
Coleonol D
R = OH, R' = OAc
Coleol
R,R' = H



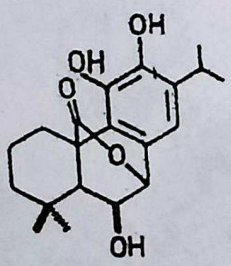
Coleonol E
R,R'= H, R'' = Ac
Coleonol F
R = Ac, R' = OH, R'' = H



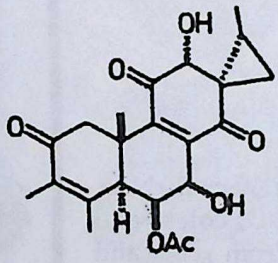
Barbatusol



Coleonone



6β-Hydroxycarnosol



Plectrin

Biological Activity

Naphthopyrone (0.5 mg/kg, i.v.) decreased blood pressure in cats from 110 mm to 30 mm Hg in 2 min lasting 45 min; it had LD_{50} 150 mg in cat; an unidentified diterpene from roots exhibited hypotensive and spasmolytic activities; coleonol lowered blood pressure of anaesthetised cats and rats and of spontaneously hypertensive rat; in small doses it had positive inotropic effect on isolated rabbit heart and on cat heart *in vivo*, whereas large dose, hold depressant action on central nervous system. Coleonol also exhibited non-specific spasmolytic activity on smooth muscle of gastrointestinal tract; forskolin stimulated renin release from isolated perfused rat kidney two-fold at 0.1. μM or three-fold at 1.0 μM; stimulation was blocked by angiotensin but not by the β-adrenoceptor antagonist, atenolol; topical ocular application of forskolin lowered intraocular pressure (IOP) in rabbits, monkeys and human volunteers. A topical suspension of forskolin (1.0%) significantly lowered IOP (70.0%) in 1 hr but remained significant for at least 5 hr; forskolin increased force of contraction and pacemaker

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activity of isolated guinea pig atrium. It potentiated Ca^{2+} -dependent contraction in atrium. Forskolin lowered Na^{+} -K^{+} -ATPase and increased adenylate cyclase activities in rat heart slices. Forskolin and cardiac glycosides had additive positive inotropic effects on guinea pig atrium. It inhibited norepinephrine-induced contractions in isolated guinea pig artery and angiotensin. It induced contractions in guinea pig colon and aorta; forskolin (1.0. μM) inhibited arachidonate– and ADP-induced serotonin release in human platelets by 100.0 and 60.0% respectively. It enhanced or inhibited phosphorylation of human platelet proteins, depending on the molecular weight of protein involved; barbatusol (3 mg/kg, i.v.) in rats, induced potent lowering of blood pressure associated with discrete bradycardia.

Nonacosane, hentriacontane, dotriacontane, tritriacontane, pentatriacontane, β-sitosterol and stigmasterol were identified in leaves.

Preparation

Juice of leaves. Dose–½ to 1 drachm.

Action

Antispasmodic, antilidtic, cathartic, stimulant and stomachic.

Uses

Juice mixed with sugar is given to children in colic; in asthma, chronic cough, strangury, calculus, gonorrhoea, piles and dyspepsia. Crushed *leaves* are used as a local application to the head in headache and to relieve the pain and irritation caused by stings of centipedes. *Expressed juice* is applied round the orbit to relieve the pain in conjunctivitis. It is also given in chronic cough, fever, epilepsy and other convulsive affections. This is called *Ovapana* from the aromatic taste and odour of its leaves resembling those of Ptychotis ajowan. A favourite Indian dish called *Bajeh* is made of the mopped leaves.

Commelina bengalensis, Linn.
(Family: Commelinaceae)

Vernacular Names

Sans.–Kanchata; *Hind. & Ben.*–Kanchara; *Tam.*–Kanang-Karai, Kanavazhiain; *Ben.*–Kanchira, Jata-Kanshira, Dholapata.

Habitat

This weed is common in South India.

Action

Demulcent, refrigerant and laxative.

Constituents

A new triterpene–dammar-12,25-dien-3β-acetate–along with 2-heneicosanone, octacosanol, sitosterol and its glucoside isolated.

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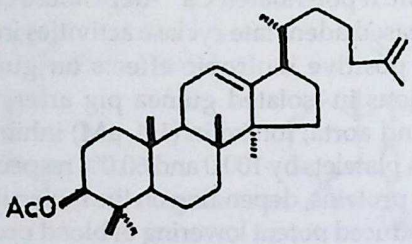
New Compounds



Dammar-12,25-dien-3β-acetate

Conium maculatum, Linn.
(Family: Umbelliferae)

Vernacular Name

Ind. Baz.–Kurdumana

Botanical Description

A biennial herb with a tall, hairless, furrowed, branched and hollow stem, its lower part smooth and purple spotted. The smooth, alternate, finely divided (two to four times pinnate) leaves are coarsely toothed, dark green above and grey green below. The petioles are long and sheath the stem at the base. The small white flowers with un-notched petals are arranged in terminal compound umbels. The fruit is a roundish double achene with wavy ribs. *All parts of the plant, especially the green, almost ripe seeds, are deadly poisonous* and have a fetid smell. This marked smell (of mice) and the presence of purple biotches on the stems and petioles and the form of the fruit distinguish Hemlock from many other members of the umbellifer family.

Habitat

Hemlock grows wild in damp places, open woods and near water throughout most of the British Isles. The plant's generic name, *Conium*, comes from the Greek word *koneion*, which may in turn be derived from *konos* (= a cone), but the reason for this connection is not clear. The specific epithet, *maculatum*, means 'spotted' and refers to the stalks. The origin of the common name is unknown. The poisonous effects of Hemlock were known to the ancient Greeks who used it for executions. For example, Socrates was put to death in 399 BC by being given Hemlock juice to drink. Greek and Arabic physicians considered Hemlock an effective treatment for tumours, pains in the joints and for skin infections. The plant is little used today in medicine.

Constituents

Structure of γ-coniceine revised to 2-propyl-3,4,5,6-tetrahydropyridine.

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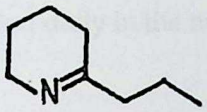
New Compounds



γ-coniceine

Biological Activity

Coniine, N-methylconiine and γ-coniceine were tested on isolated tissues, anaesthesised cats and hens, conscious mice and young chicks; their most pronounced action was to block spinal reflexes. Large doses stimulated skeletal muscles and subsequently caused neuromuscular block.

Uses

The fruits are the most medicinally active parts. The main constituents are poisonous alkaloids, principally coniine, and essential oils and organic acids. A tincture of Hemlock is still used by qualified practitioners in homeopathy. The isolated pure coniine is also contained in a few proprietary ointments and suppositories to relieve severe pain. *Hemlock is a highly dangerous plant and it should never be collected and used for self-medication.* Even a small dose can be fatal.

Convallaria majalis
(Family: Liliaceae)

Vernacular Name

Eng.–Lily-of-the-Valley.

Botanical Description

A perennial herb with a tangle of underground rhizomes which, in spring, bear stalked, broadly elliptic leaves, two on each stem, and later a scape with a one-sided raceme of drooping white, sweet-scented, bell-shaped flowers. The fruit is a bright-red, globose berry. *All parts of the plant are extremely poisonous* and children should be warned not to eat the attractive berries.

Habitat

Lily-of-the-Valley grows throughout Europe in the undergrowth of shady woods, in thickets and hedgerows, mostly for lime-rich soils. It grows wild locally in England and Wales and in Scotland, but it is becoming rarer. It is not native to Ireland. The plant has long been grown in gardens. The common and generic names refer to the plant's usual habitat. Lily-of-the-Valley has a long history of medical use for heart conditions. The leaves yield a yellow dye and at one time the dried ground roots were an ingredient of snuff.

Constituents

Deglucocheirotoxin, convallatoxin, convallatoxol, convalloside and a new glycoside J, m.p. 234°, identified at strophanthidol-O-α-L-rhamnosyl-D-glucoside, from seeds; convallatoxin, glucoconvalloside, convallatoxoloside, convalloside and convallatoxol from different parts.

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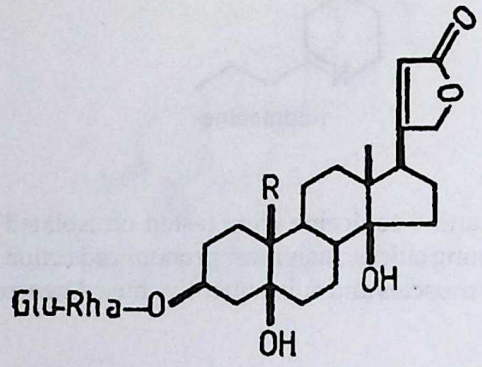
New Compounds



Convallatoxoloside
R = Me
Glycoside J
R = CH_2OH

Uses

The flowering stems, but more often the leaves, are used medicinally. They contain poisonous cardiac glycosides, among them convallotoxin, convallatoxol and convalloside, and also saponins, essential oils and organic acids. The individual glycosides are isolated and included in proprietary medicines prescribed for various heart conditions. The glycosides are considered as effective and safer than digitalin from foxgloves (*Digitalis* spp.) for regulating heart action. Tinctures of Lily-of-the-Valley are also used in homeopathy. Contrary to the advice in some popular herbal books, *Lily-of-the-Valley should never be collected and used for self-medication.* It is a dangerous plant and should be used only under strict medical supervision. Some components have purgative and emetic actions. The berries may cause paralysis and respiratory failure and a doctor's help should be sought immediately if a child eats them.

The aromatic extracts from the flowers are used in the cosmetic and perfumery industries.

Convolvulus microphyllus, Linn.

Vernacular Names

Mah.–Shankravalli; *Hind.*–Sankhapushpi.

Illness : **Excessive menstruation**
Part used : Whole plant
Preparation : Wash the plant well and crush it to remove the juice.
Dosage : ½ cup juice to be taken morning and evening, until bleeding stops.
Illness : **Abscess**
Part used : Entire plant

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Preparation : Grind the plant to a fine paste and tie it on the abscess.

Dosage : The paste is applied daily in the morning until cured.

Conyza canadensis
(Family: Compositae)

Vernacular Name

Eng.–Canadian Fleabane.

Botanical Description

An annual herb with an erect, glabrous of slightly hairy stem, which is much branched near the top. The leaves are slightly hairy and linear to lanceolate. The numerous small bell-shaped flowerheads are arranged in long terminal panicles; the small ray-florets are whitish, the disc-florets pale yellow. The fruit is a yellow downy achene.

Habitat

Canadian Fleabane is a native of North America but it was introduced into Europe in the 17th century and it has become a troublesome weed of field and garden, the small light seeds being easily dispersed by wind. In the British Isles it is locally common in dry waste places and on cultivated ground throughout most of England and Wales, but it is rare in the north. Canadian Fleabane is related to plants that were supposed to drive away fleas, hence the common name. The seeds were also thought to look like fleas. The former generic name, *Erigeron*, comes from the Greek words *eri* (= early) and *geron* (= aged person) and refers to the 'worn-out' appearance of some of the species in the genus, even when still in flower. The plant was introduced into medical practice in the 18th century. It was regarded as a useful remedy for diarrhoea, dropsy and many kidney disorders. It is still used in herbalism.

Foothills of Himalayas, from Himachal Pradesh eastwards and Khasia Hills, ascending upto 1500 m.

Constituents

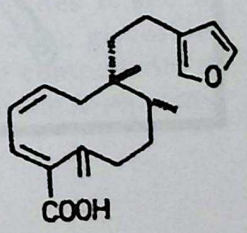
It is used for treatment of diarrhoea. Vanillic and syringic acids isolated from leaf and stem.

Biological Activity

Vanillic acid and syringic acid showed antibacterial activity. Strictic acid, clerodatrienoate and 5,7-dihydroxy-3,4',8-trimethoxyflavone isolated.

Conyzic acid and strictic acid found to be identical; the revised structure proposed.

New Compounds



Conyzic acid

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Uses

The flowering stems are used medicinally. Their constituents include an essential oil with limonene and terpineol as its main components, tannins and choline. These substances give Canadian Fleabane astringent, diuretic and haemostatic actions. Herbalists prescribe an infusion or decoction for severe diarrhoea, gravel and kidney disorders, and for throat infections. A tincture is used in homeopathy for these complaints and for haemorrhoids and painful menstruation. The essential oil (oil of erigeron) obtained by distillation of fresh plant material has been used to expel intestinal parasites.

Corchorus capsularis

(Family: Tiliaceae)

Vernacular Names

Sans.–Nadika, Patta, Singgika; *Eng.*–Jute; *Fr.*–Corchore Capsulaire; *Mah.*–Kurru Chantz; *Guj.*–Chunchdo, Motichunch; *Ben.*–Tita-Pat, Lalitapat, Koshta; *U.P.* & *Punj.*–Bawphal; *Hind.* & *Ben.*–Pat; *Hind.*–Singhin, Janascha; *Tam.*–Piratti-kirai; *Tel.*– Parinta; *Bom.*–Tankal, Chunch.

Habitat

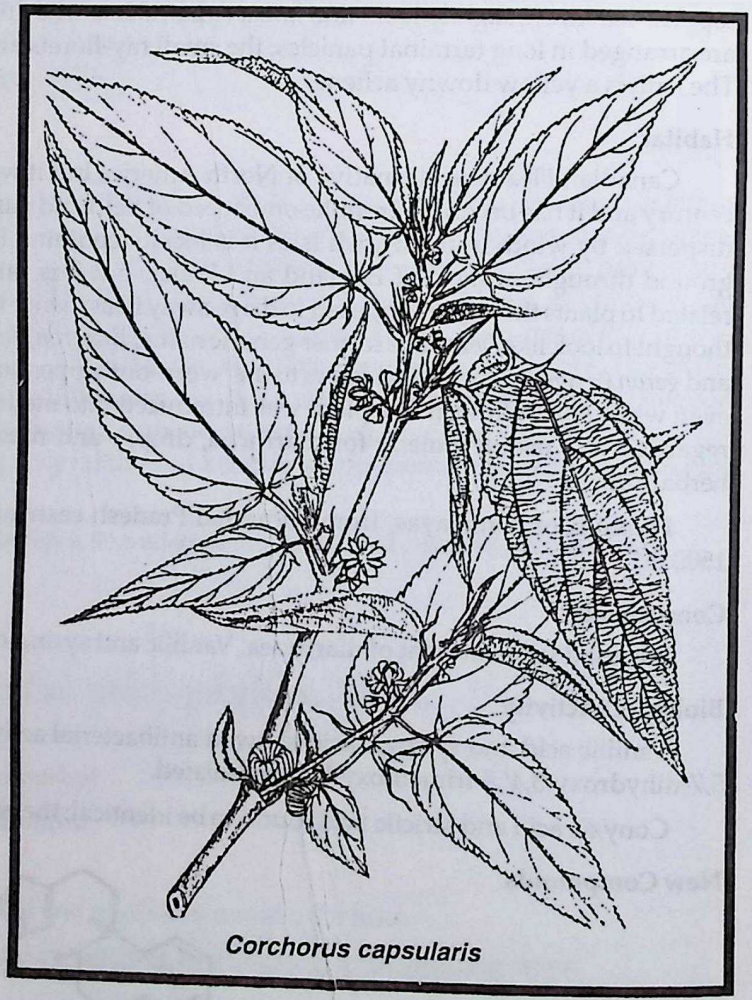
Indigenous to many parts of India; a low country weed in Ceylon. Extensively cultivated in Eastern Bengal.

Parts Used

Leaves and seeds.

Constituents

Capsularin; jute seed oil contains the glycerides of oleic and linolic acids. "*Corchorin*" ($C_{22}H_{36}O_8$) active principle of the seeds which is a glucoside, of bitter taste, m.p. 174-175°, has been isolated. It gives a pentacetyl derivative, crystalline. Corchogenin ($C_{16}H_{26}O_8$) forms a dibromide on bromination with Phenylhydrazine a solid m.p.



Corchorus capsularis

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165-170°. *Corchorin* forms with bromine a dibromide m.p. 100° (decomp.) and on acetylation acetylcorchorin (m.p. 158° with decomposition).

Action

Leaves are demulcent, bitter, tonic, stomachic, laxative, carminative, refrigerant and diuretic. Seeds are bitter and purgative.

Uses

Infusion of the leaves is useful in atomic dyspepsia, liver disorders, and as a fever-drink; also in some cases of chronic cystitis, gonorrhoea, dysuria, in worms of children, hepatic and intestinal colic and gastric catarrh. *Leaves* and *tender shoots* are eaten and in the dried state known as *Nalita*. *Cold infusion* of dried leaves is used as a bitter tonic; it can be safely given to patients recovering from acute dysentery to restore appetite and improve strength. Six grains of the *powder* combined with an equal quantity of Curcuma longa has been used; with success in acute dysentery. A *compound infusion* of the leaves with coriander and aniseed is a very good bitter stomachic and tonic. Seeds are bitter, and are given in 60 to 80 grain doses in fevers and obstructions of the abdominal viscera. Pure jute-seed oil is suitable as a food.

Corchorus fascicularis, Lam.
(Family: Tiliaceae)

Vernacular Names

Hind.–Bhapali; *Bom.*–Hirankhori.

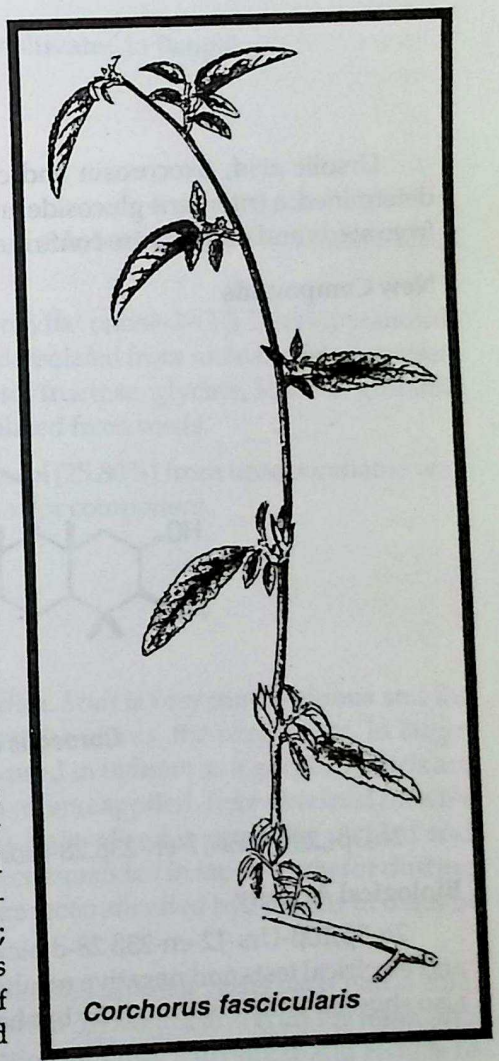
Action

Astringent, restorative.

Constituents

Determination of cardiac glycosides in seeds by colorimetry; glycoside moisture contained olitoriside and corchoroside; veticoside, mp. 168°, from seeds.

Structure of olitoriside from seeds elucidated as strophanthidin–3-β-D-boivinosido-β-D-glucoside; a new cardiac glycoside–corchoroside A–from seeds; seeds contained aglycones–strophanthidin and corchorgenin; glycosides–corchsularin, olitoriside and corchorosides A and B; corchoralic acid, β-sitosterol and a saponin; glycosides determined colorimetrically and main components of glycoside mixture–olitoriside and corchoroside A–separated by TLC; veticoside, mp. 168°, from seeds.



Corchorus fascicularis

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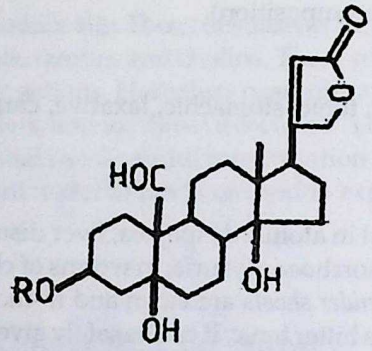
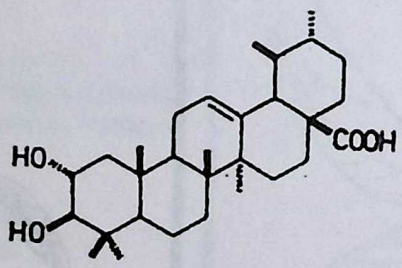
New Compounds



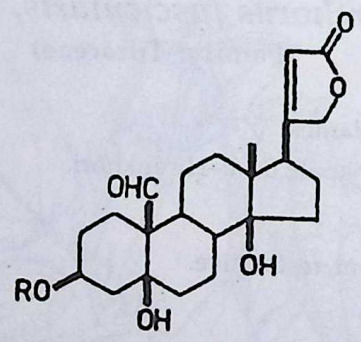
Corchoroside A
R = D-Boivinose
Olitoriside
R = D-Boivinose-Glu.

Ursolic acid, oxocorosin and corosolic acid isolated from roots; structure of corosolic acid determined; a triterpene glucoside and β-sitosterol glucoside from leaves; a new glycoside (I) isolated from seeds and its structure confirmed.

New Compounds



Corosolic acid



I
R = Boivinose(4→1)Glu(6→1)Glu

2α,3β-,20β-Urs-12-en-23β,28-dioic acid 2,3-diacetate isolated.

Biological Activity

2α,3β,20β-Urs-12-en-23β,28-dioic acid 2,3-diacetate showed positive analgesic results in chemical and electrical tests and negative results in thermal and mechanical (Mouse tail clip method) tests and also showed antipyretic activity but had no effect on spontaneous moto activity.

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Cordia latifolia, Roxb.

(Family: Boragineae)

Vernacular Names

Sans.–Bahuvara, Sleshmataka, Selu; *Eng.*–Sebesten plum or fruit; *Hind.*–Bara-Lasora; *Arab.*–Dibaka, Mukhitaha; *Guj.*–Gudan, Bargund; *Mah.*–Shelvan, Bhokar; Bom. & *Pers.*–Sapistan; *Ben.*–Bahubar, Balphal, Buro-bahuri; *Tel.*–Botuku, Nakkaeru; *Tam.*–Naruvilli; *Mal.*–Naruviri; *Can.*–Mannadikay, Doduchallu; *Kon.*–Sharpala.

There are two species–great and small; the adjective "great" or "small" is added to these names to distinguish the two species. In the greater species, *i.e., C. Obliqua* the pulp is separable from the stone.

Habitat

A small deciduos tree growing nearly all over India and cultivated in Bengal.

Parts Used

Fruit, its mucilage, kernel and bark.

Constituents

Pulp of the fruit contains sugar, gum, extractive matter and ash; bark contains a principle allied to "*cathartin*".

Taxifolin-3,5-dirhamnoside from seeds; 3′,4′,5,7 tetrahydroxyflavonone-3-O-β-D-xylopyranoside isolated from seeds; lupa-20(29)-ene-3-O-α-L-rhamnopyranoside isolated from roots and characterised; glucose, xylose, rhamnose, glucuronic acid, arabinose, lactose, fructose, glycine, leucine, glutamic acid, cystine, alanine, threonine, aspartic acid and proline isolated from seeds.

Hydrocarbons (22.58), n-hexacosanol (29.35)and β-sitosterol (25.80%) from unsaponifiable wax from leaves; GLC of hydrocarbons showed n-nonacosane as major component.

Action

Fruit is demulcent; bark is mild astringent and tonic.

Uses

Ripe, dried fruit is the Sebesten of the Indian Materia Medica. *Fruit* is very mucilaginous and the *mucilage* is highly esteemed in coughs, in diseases of the chest, the uterus, the urethra etc. In larger quantities it is given in bilious affections as a laxative. *Bark* is used in *infusion* as a gargle. *Kernels* are a good remedy for ringworm; they are powdered mixed with oil and applied. *Juice* obtained *from the bark* and administered in coconut milk relieves severe colicky pains. Fruit is generally pickled and eaten, when ripe, in India. Ashes of burnt Cordia Obliqua are recommended in *Ilaj-ul-gurba* for dusting over in cases of prolapsus ani. Following compound syrups are recommended by Hakims in cases of bronchitis, pneumonia and phthisis:

1. Take of Lijuorice, Aniseed, common mallow, *Hansraj* Maiden hair ferns each half a tola, Hyssopus officinale and *Methi* each quarter tola, Cordia myxabark and fruit 7½ tolas, and poppy capsules with seeds 11 pieces. Make a decoction and mix with sugar and reduce to the consistency of syrup 1 lb. *Dose*: Two to four tolas thrice daily–(Ilaj-ul-Gurba).

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2. Take of *Zuja* 2 drs., Marsh mallow root 4 drs., Common mallow 4 drs., Liquorice 1½ drs. figs 5, poppy capsules 6 drs., aniseed 6 drs., Sebesten fruits 40, Jujub berries 40, boiling water 4 pints. Macerate the whole for 12 hours; then boil down to half the quantity of water and strain. Add 2 lbs. of sugar and prepare a syrup. *Dose*: ½ to 1 ounce to be diluted with water.

Coriandrum sativum, Linn.

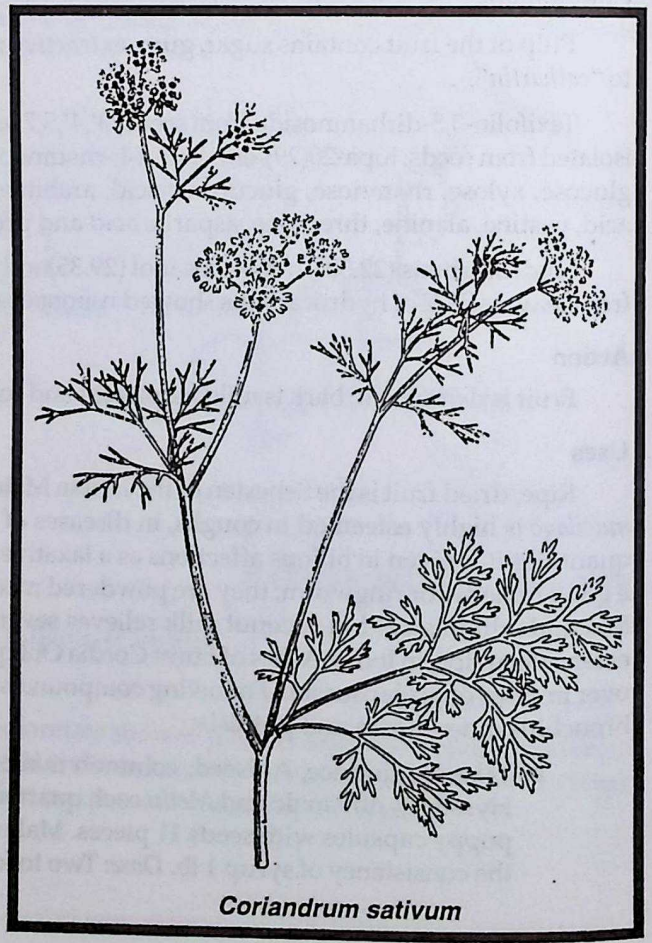
(Family: Umbelliferae)

Vernacular Names

Sans.–Kustumbari, Dhanyaka; Gr.–Koriyun; *Fr.*–Coriander cultive; *Ger.*–Gemeiner coriander; *Eng.*–Coriander; *Hind.*–Kottmir, Dhania; *Arab.*–Kusbara; *Ben.*–Dhane; *Sind.*–Dhano; *Burm.*–Nau-nau; *Mah.*–Kothimbir (green leaves), Dhane (seeds); *Guj.*–Dhana, Dhania; *Pers.*–Kishniz, Kushniz; *Tel.*–Kotimiri; *Tam.*–Kottamalli; *Mal.*–Kottampalari; *Can.*–Kotambri-beeja, Haveeja; *Kon.*–Kottumbari.

Botanical Description

An annual herb with an erect, furrowed, solid, branched stem. The alternative leaves are pinnate or bipinnate, the lower ones with broader leaflets than the upper ones which are finely divided. The white or pink flowers, with outer petals outer than the inner ones, are arranged in compound umbels. The fruit is an ovoid, ribbed, red-brown double achene. All parts of the plant smell strongly of bed bugs. However, the fruits lose their disagreeable scent when they ripen and become pleasantly spicy and aromatic.



Coriandrum sativum

Habitat

A herbaceous plant extensively cultivated in all parts of India for its seeds.

Coriander is native to the eastern Mediterranean region and India but if has been cultivated and used as a medicinal and culinary herb for at least 3,000 years. It is grown on a small scale in Britain but most supplies of the herb are imported. The plant can sometimes be found growing wild in waste places in Britain as a garden escape. There is uncertainty about the generic name, *Coriandrum*; it may be derived from the Greek word *koris* (= a bug), a reference perhaps to the plant's smell and the appearance of the fruits.

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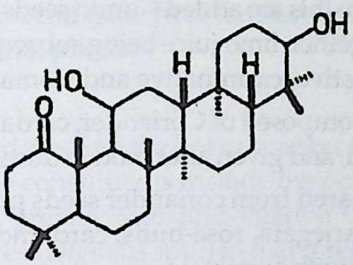
Parts Used

Fruit (coriander fruit) and leaves.

Constituents

Linalool (90.0), furfural and geraniol identified in essential oil (0.65-0.73%) of plant from Vietnam; a process developed for extracting essential oil which contained linalool (68.22) arid geraniol (2.87%); butylphthalides–neocnidilide and Z-ligustilide analysed by GLC in different parts of plant from Netherlands; coriandrinonediol m.p. 285°, (0.006%) isolated from seeds and characterised.

New Compounds



Coriandrinonediol

The green vegetable contains 84.00 moisture, and the dried material contains Ether, extract 3.12; Albuminoids 24.46 (containing Nitrogen 3.93); Soluble carbohydrates 43.30; woody fibre 9.75 and Ash 19.37 (containing Sand 1.50); p.c. respectively. Fruits yield a volatile essential oil 1 p.c., fixed oil 13 p.c., fatty matter 13 p.c., mucilage, tannin, malic acid and ash 5 p.c. Coriander oil contains Coriandrol (linalcol) an alcohol 2 d-pinene, 1-pinene, geraniol and baborneol.

Action

Fruit is aromatic, stimulant, carminative, stomachic, antibilious, refrigerant, tonic, diuretic and aphrodisiac. Fresh leaves are pungent and aromatic.

Preparation

Infusion (cold) 1 in 40, *dose*: 1 to 2 ozs., oil, dose 1 to 4 minims; powder and compound powder of the fried seeds containing black-pepper, cloves and common salt; decoction of the fruit and poultice.

Uses

Fruit is generally used by all classes as a condiment; and by some along with betel leaves; used to flavour purgatives and to prevent griping. It disguises the taste and smell of rhubarb and senna better than any other drugs. In England, according to Bentley and Trimen, the oil is used in cookery and for flavouring gin, also to correct the griping qualities and bad taste of other medicines. Oil is very useful in flatulent colic, rheumatism, neuralgia etc., dose is from 1 to 4 minims on sugar or in emulsion; the *dried fruit* has also similar effect; it is generally used in *infusion* or *decoction* in sore-throat, flatulence, indigestion, vomiting, other intestinal disorders, common catarrh and bilious complaints. In combination with cardamom and caraway it forms a good carminative. An *eye-wash* is prepared by Mahomedans by decocting the fruits for preserving the sight in small-pox; it is also useful in chronic conjunctivitis. *Seeds* are generally chewed to correct foul breath and form one of the principal flavouring ingredients of curries; *roasted seeds* are useful in dyspepsia in doses of ½ to 1 drachm. They are made into a *paste* and applied to relieve pain in cephalalgia and coughs; as a *gadgle* they are useful in thrush and as a *poultice with* barley meal added, applied to chronic ulcers and carbuncles. *Juice of the fresh plant* is an application to erythema. A strong *decoction in milk* (1 in 40) with sugar added to taste is given in cases of bleeding piles, as well as in dyspepsia, indigestion and flatulence; *cold infusion* of

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seeds or *powder* of fried seeds with a little sugar is very useful in colics of children; also relieves internal heat and thirst. Coriander is considered to lessen the intoxicating effects of spirituous liquors, and is used as a carminative in convalescence after diarrhoea. In mixture, *coriander water* (*aqua coriandari*) is pleasant and grateful, and is useful in indigestion and other bowel complaints. *Leaves*, when green, are eaten raw as well as used for preparing a sauce of *chutney*, like the leaves of spearmint, which is useful as carminative and antibilious.

Following are some very popular and useful prescriptions:

1. A preparation called *Dhana-ni-dala* or fried coriander is thus made: Fruits are lightly pounded, husks being removed; to this are added Cumin seeds, black pepper, cloves and common salt. The whole is stirred together, lime-juice being subsequently added and the mass dried in the sun. It is useful as digestive, carminative and stomachic.
2. A compound powder composed of Coriander, cardamom and caraway seeds in equal parts parched and pulverised, and given after food in doses of 1 drachm, is a very useful digestive.
3. A cooling drink is prepared from coriander seeds pounded with fennel fruit, poppy seeds, flowers of Bauhinia. Variegata, rose-buds, cardamoms, cubebs almonds and a little black pepper; it is sweetened with sugar.
4. Take of *Hijir-ul-Yahud* Coriander seeds, aniseed, Physalis minima each 16 grains and water 2 chataks or 1/8 seer; strain. To be taken at bed-time. "Zad Garib" recommends this as useful in diseases of the genito-urinary system chordee, etc.
5. Take of Coriander and chebulic myrobalan in equal parts. Roast on fire and make a decotion. To be taken for a week. Useful in vertigo.
6. The of Poppy seeds, Coriander, cotton seed, each 1 part in powder and sugar 2 parts. To be taken with rose water, twice daily for vertigo–(Ilaj-ul-gurba).

The fruits contain up to 1 per cent of an essential oil with a linalool (coriandrol) as its main component, plus fatty oil, proteins, tannins, pectin, sugars and vitamin C. The dried fruits are used by themselves or in tea mixtures, primarily as an aperitif, as a digestive tonic and a carminative. Coriander also has a sedative effect. The essential oil (coriander oil), obtained by distillation from the fruits, is used to make a water solution for windy colic with much the same effect as that made from Caraway (*Carum cavi*). It is also used in many compound preparations and to disguise the taste of other medicines. The fruits–or the oil on its own–are included in ointments for painful rheumatic joints and muscles.

Coriander is an important culinary herb. The fruits and the fresh leaves are widely used for flavouring food and the root can be cooked and eaten as a vegetable.

Coronilla varia
(Family: Leguminosae)

Vernacular Name

Eng.–Crown Vetch.

Botanical Description

A perennial herb with a deep root and a straggling, branched, ascending stem. The alternate leaves are odd-pinnate with no tendril. The white, purple or pink flowers are arranged in a solitary

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rounded umbel at the end of a long stalk, which is longer than the leaves and grows from the leaf axils. The flowers appear in succession almost all summer long. The fruit is a four-angled erect, slender, jointed pod with a terminal beak. *The plant is extremely poisonous* and cattle avoid it. Children should be warned not to pick the flowers for posies.

Habitat

Crown Vetch is native to central and southern Europe, but it has been introduced to the British Isles and it is now well naturalized in several scattered localities. It grows in grassy places, on roadsides and in hedgerows, mostly on lime-rich soils. The generic name, *Coronilla*, is a diminutive of the Latin word *corona* (= a crown) and refers to the arrangement of the flowers. In the common name 'vetch' is a corruption of the Latin word *vicia* for bean plants.

Uses

The flowering stems have been used medicinally but nowadays the plant is generally regarded as too toxic for use as a herbal remedy. The constituents include the poisonous water-soluble glycoside coronillin, tannins, bitter compounds, organic salts and vitamin C. Coronillin has an action very similar to that of digitalin from foxgloves (*Digitalis* spp.) in that it regulates heart action. *Crown Vetch is a dangerous plant and it should never be collected and used for self-medication.* Symptoms of poisoning are pallor, diarrhoea, rectching, muscular spasms and eventually coma and death.

Corydalis cava or *C. bulbos*

(Family: Fumariaceae)

Botanical Description

A perennial herb with a large, hollow, globose, underground tuber with wiry roots. The stem is erect and bears two biternate lobed leaves, bluish green below, and light green above. The irregularly shaped violet or white flowers are arranged in a solitary terminal raceme. The upper petal is drawn out into a long, apically curved spur. The fruit is a capsule. All parts of the plant are extremely poisonous.

Habitat

Bulbous Corydalis is found throughout Europe and neighbouring parts of Asia. It grows in open woods and hedgerows, where it is conspicuous in spring with its early flowers and greyish stems. It is attractive to bees. Bulbous Corydalis is also grown as a garden plant and although it is not native to the British Isles it is occasionally found in the wild as a garden escape. The generic name, *Corydalis*, comes from the Greek word *korudallis* (= crested lark), and refers to the appearance of the flowers. The specific epithet, *cava*, means 'hollow'. Bulbous Corydalis has been used as a vermifuge in the past. Nowadays it is not used in herbal medicine but the isolated constituents still have a place in conventional medicine.

Constituents

A new alkaloid–consperine–isolated together with corynoline, acetylcorynoline, corynoxine and corynoloxine and its structure elucidated.

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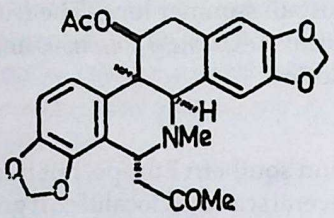
New Compounds



Consperine

Synthesis of sendaverine and corgoine. Sinactine, apocavidine, stylopine, (+)cavidine, cheilanthifoline, dehydrocavidine, yenhusomine, yenhusomidine, corlumine, dihydrosanguinarine and protopine isolated from leaves and stems.

Biological Activity

(+)Cavidine, protopine, corlumine, yenhusomine and dihydrocavidine exhibited spasmolyic activity.

Synthesis of canadine. (+)Hydrastine isolated; total alkaloid content of roots (0.63%) which consisted of pancoridine, pancorinine, sanguinarine, bicuculline, protopine, wilsonirine and N-methylcorypalline. Aerial parts contained 1.65% alkaloids of which cheilanthifoline, isocorypalmine, soulcrine, reticuline, N-methylcoclaurine, (+)β-hydrastine, bicuculline, adlumine, protopine, stylopine, sanguinarine, dihydrosanguinarine, coreximine, isoboldine, juziphine, corypalline, hydroxymethylstylopine and pycnarrhine identified.

Uses

The tubers are used medicinally. When dried they have a strong aroma and bitter taste. They contain alkaloids, the most important being corydaline and bulbocapnine. Bulbocapnine has antispasmodic, sedative and hallucinogenic properties. It lowers the blood pressure and inhibits the contractions of striated muscles. In some countries it is used in preparations to treat Parkinson's disease and other serious neurological disorders, vertigo and muscular tremors. Bulbocapnine is also beneficial before and after treatment with anaesthetics. Large doses of the drug can cause severe headache and other side effects. *Bulbous Corydalis is a dangerous plant and it should never be collected and used for self-medication.*

Corylus avellana, Linn.

(Family: Cupuliferae)

Vernacular Names

Hind.–Findak; *Eng.*–Hazel nuts.

Botanical Description

A tall shrub, rarely a small tree, with smooth, reddish-brown peeling bark. The leaves are entire, oval to rounded, doubly, serrate and hairy. The plant is monoecious; the male flowers are clustered in pendulous catkins; the female flowers are in erect, short, bud-like spikes with protruding red styles.

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The flowers appear early in spring before the leaves and produce large quantities of pollen. The fruit is a hard, brown, rounded nut (cobnut) enclosed by the irregularly lobed green involucre.

Habitat

Hazel is common in woods, scrub and hedges throughout Europe, including the British Isles. There are also many cultivated varieties. The generic name, *Corylus*, is said to come from the Greek word *korys* (= a helmet), an allusion to the shape of the fruit. The common name, which is a corruption of the Anglo-Saxon word *haesel*, may have the same meaning. Hazel is seldom used in conventional medicine and only little used in herbalism. Mostly the plant is grown for its nutritious nuts and the oil from them. Hazel rods are used to make hurdles, wattles, hedging and baskets.

Constituents

Chromatographic and biological analysis of growth regulating substances in pollen extract; biological tests on oat coleoptiles; chromatogram of chloroform extract showed presence of inhibitors and a new strongly growth-stimulating substance different from indole-acetic acid; chromatogram of acidic ether extract showed presence of activator, inhibitor and a substance with strong auxin activity.

Taraxerol and stigmast-5-en-3α,7α,21α-triol and β-sitosterol from leaves.

Uses

The leaves, bark and fruits have medicinal actions. The main constituents of the leaves are essential oils, glycosides and sugars; those of the bark chiefly tannins and organic acids. These substances give the leaves diuretic properties and they have been used in tea mixtures. They have also been used for treating varicose veins and circulatory disorders. Externally they have been used in bath preparations to treat haemorrhoids and slow-healing wounds. The nuts contain up to 60 per cent fatty oils, plus proteins, sugars and vitamins. They are very nourishing and tasty and are widely used in confectionery and bakery goods. The expressed oil from them is a valuable salad and vegetable oil and it is also used to make soap and cosmetics and as a machine lubricant.

Costus speciosus, Sm.
(Family: Scitaminaceae)

Vernacular Names

Sans.–Pushkara, Kashmeera, Kemuka; *Mah.*–Penva; *Hind.*–Keu, Kust; *Ben.*–Keu, Kura; *Tel.*–Kashmeeramu; *Tam.*–Koestam; *Mal.*–Channak-koova, Narunchana; *Can.*–Pushkaramoola; *Fr.*–Costus elegant; *Ger.*–Practige Kostwur; Gr.–Kostus.

Habitat

An elegant climbing plant found plentifully in Bengal and Kashmir.

Parts Used

Root and tuber.

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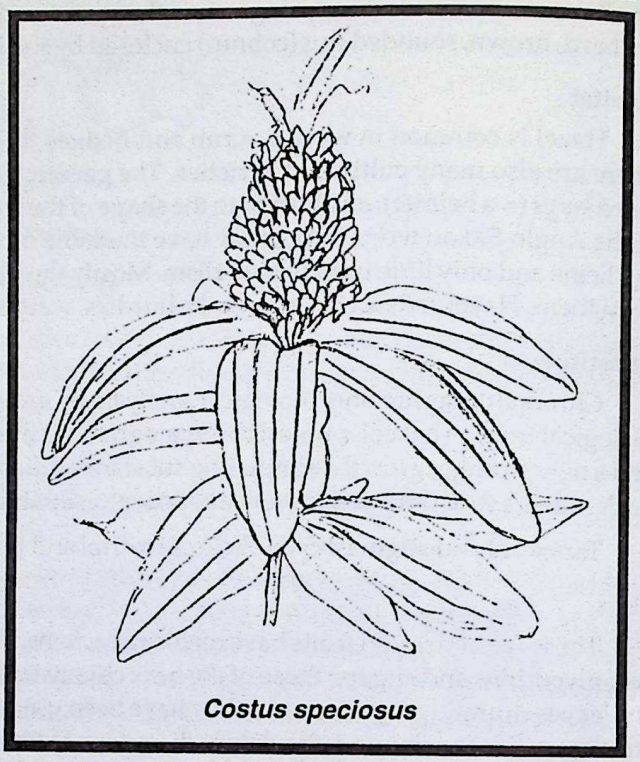
Constituents

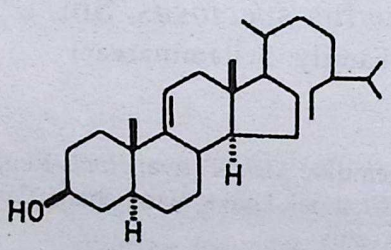
Diosgenin content in rhizomes, roots, stems and leaves 396.0, 70.0, 83.0 and 70.0% µg/g, respectively.



Costus speciosus

Saponin from seeds yielded three genins and glucose on acid hydrolysis; major genin was diosgenin; seed fat contained palmitic (26.9), stearic (8.3), oleic (40.5), linoleic (20.9), arachidic (1.7), gadoleic (0.7) and behenic (1.0%) acids; diosgenin and sitosterol isolated from seeds, stems and roots; 13C-NMR spectra of dioscin and gracillin; 24-hydroxy-triacontan-26-one and 24-hydroxyhen-triacontan-27-one together with methyl triacontanoate, diosgenin and sitosterol isolated from roots and their structures determined; 5α-stigmast-9(11)-en-3β-ol isolated from roots and characterised; 8-bydroxy-triacontane-25-one and methyl tritriacontanoate isolated from roots and characterised; two new furostanol saponins–costusosides I and J–isolated from seeds and characterised as 3-O-[β-D-glucopyranosyl (1→4)-β-D-glucopyranosyl]-26-O-(β-D-glucopyranosyl-22α-methoxy-(25R)furost-5-en-3β,26-diol and its 22-hydroxy derivative respectively; β-sitosterol-β-D-glucoside, prosapogenins A and B of dioscin, dioscin, gracillin, 3-O-[α-L-rhamnopyranosyl(1→2)-β-D-glucopyranosyl]-26-O-β-D-glucopyranosyl]-22α-methoxy-(25R)furost-5-en-3β,26-diol, protodioscin and methyl protodioscin isolated from roots and seeds.

New Compounds



5a-Stigmast-9(11)-en-3β-ol

Action

Root is bitter, astringent, stimulant and digestive, anthelmintic, depurative and aphrodisiac.

Uses

Root is useful in catarrhal fevers, coughs, dyspepsia, worms, skin diseases and snake-bites. Tuber is cooked and made into a syrup or preserve which is very wholesome.

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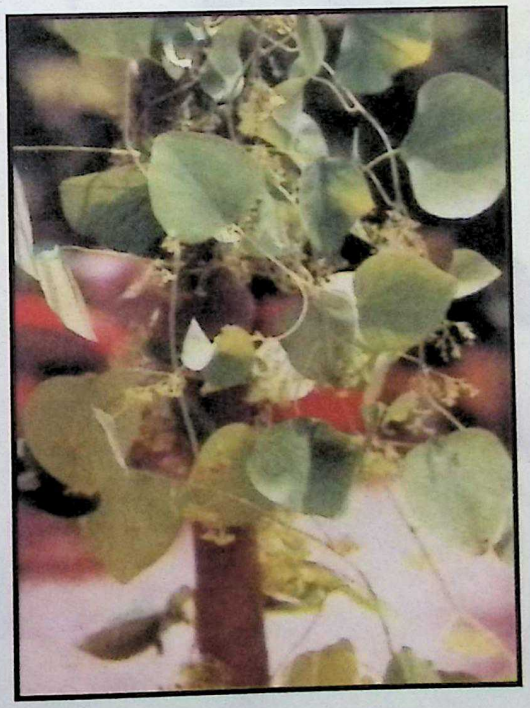
Cichorium intybus

Cinnamomum camphora

Cinnamomum tamala



Cissampelos pareira

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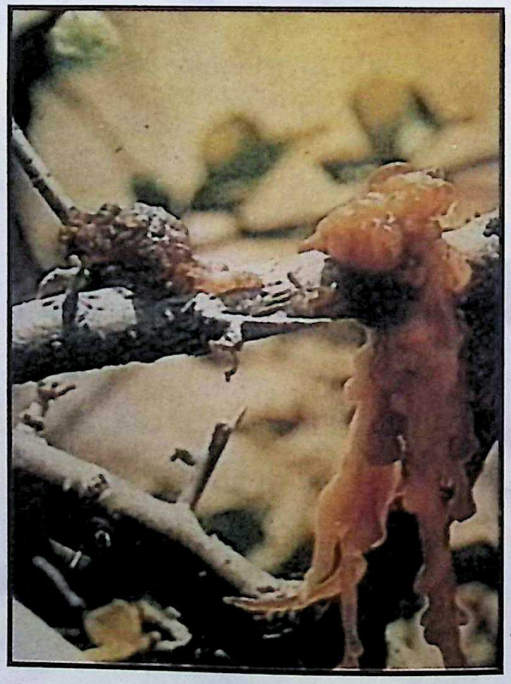
Clerodendron serratum

Colchicum luteum

Coleus forskholii



Commiphora mukul

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Coriandrum sativum

Corydalis govaniana

Costus speciosus

Crocus sativas

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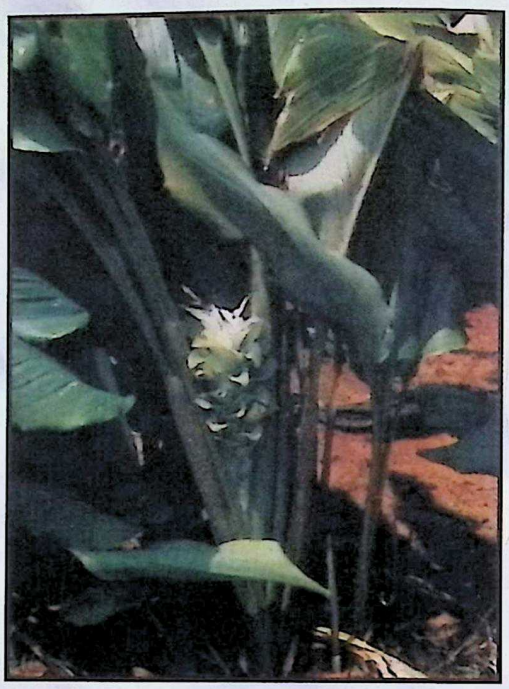
Curculigo orchioides



Curcuma domestica

Cuscuta reflexa

Cymbopogon flexuosus

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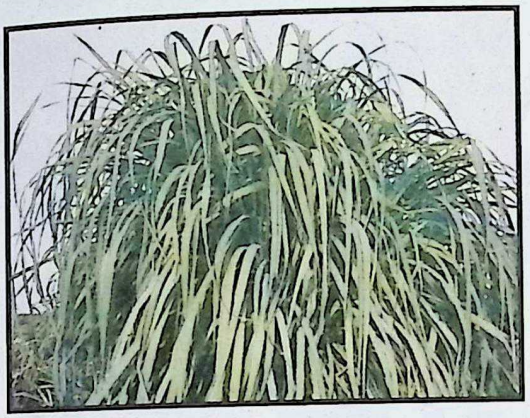

Cymbopogon winterianus

Cynodon dactylon

Cyperus rotundus

Dactylorhiza hatagirea

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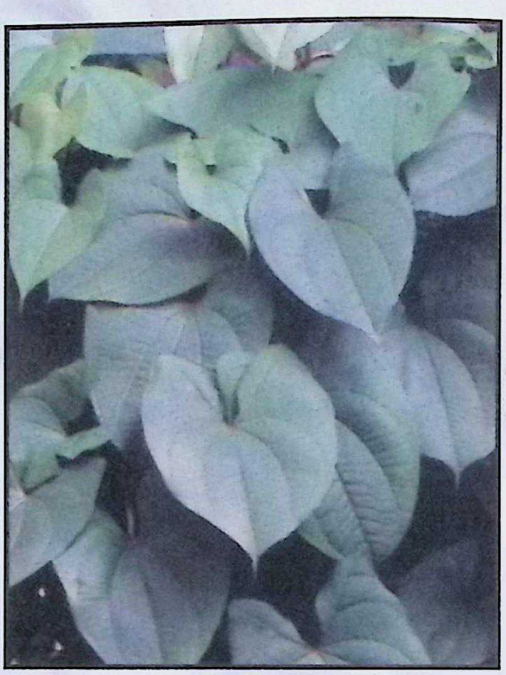
Daucus carota



Dioscorea bulbifera

Dendrocalamus strictus

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Drymarla cordata

Echinops cornigerus

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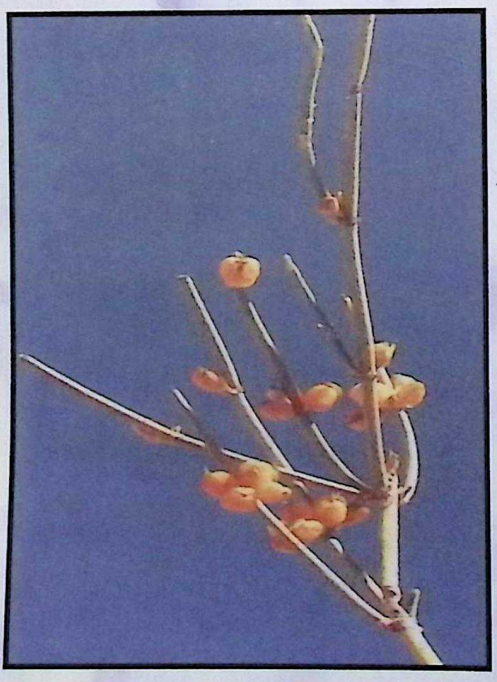
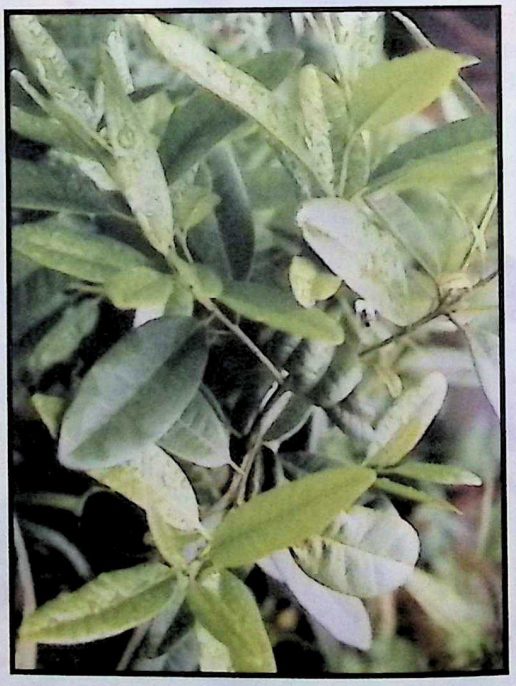
Eclipta prostrata

Emblica officinalis



Ephedra gerardiana



Eugenia caryophyllata

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Crataegus monogyna
(Family: Rosaceae)

Vernacular Name

Eng.–Hawthorn.

Botanical Description

A deciduous thorny shrub or small tree with much-branched twigs, which are felted at first, later glabrous. The dark-green leaves are wedge-shaped and deeply lobed with tufts of hair in the vein axils beneath. The leaf lobes are entire or toothed at the tips. The strong smelling white flowers are arranged in dense corymbs. The fruit (haw) is a red, barrel-shaped pome with the remnants of the appressed sepals and one blackened stigma; it has one stone.

Habitat

This hawthorn is widely distributed throughout Europe, including the British Isles, where it grows in scrub, woods and hedges. It is commoner than Midland Hawthorn (*C. laevigata*) but less tolerant of shade. Cultivated varieties of Hawthorn–mostly pink-flowering and double forms–are grown as ornamental plants in hedges. These do not have the same medicinal properties as the wild plant. The specific epithet, *monogyna*, refers to the single style in this species.

Uses

The flowers, leaves and fruits are used medicinally. They have basically the same action as parts of other hawthorn species, particularly Midland Hawthorn. The fruits contain flavonoid glycosides, organic acids, tannins, an essential oil, vitamin C, vitamin B complex and pectins. Like the flowers and the leaves the fruits have hypotensive, antisclerotic, vasodilating and sedative properties and they are used in the form of an infusion or tea mixtures in herbal medicine or in proprietary medicines to treat various heart and circulatory disorders, migraine, menopausal conditions and insomnia. Because of its effects on the heart, *Hawthorn should be used only under the supervision of a qualified medical or herbal practitioner*; no part is suitable for self-medication.

Crataeva nurvala Buch.–Ham.
(Family: *Capparidaceae*)

Vernacular Names

Sans.–Varuna, Ashmarighna, Ashmaghna; *Hind.*–Varuna.

Botanical Description

A moderate sized deciduous tree. *Bark* grey, smooth horizontally wrinkled. *Leaves* trifoliate. *Flowers* white, or cream in many flowered terminal corymbs. *Fruits* multiple seeded, ovoid berry. *Seeds* are embedded in yellow fleshy pulp.

Habitat

Evergreen tree growing widely in all parts of India.

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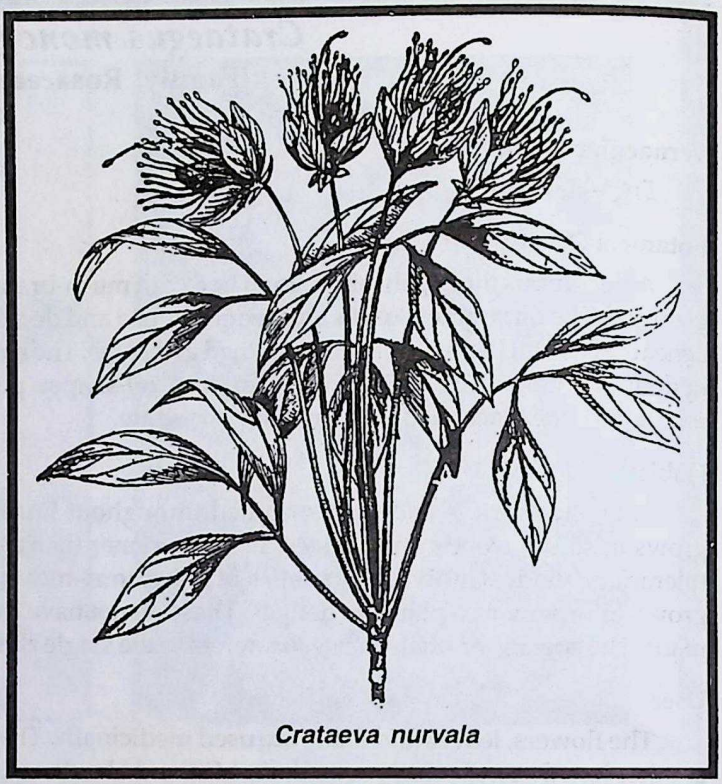
Parts Used

Roots, stem bark, leaves and flowers.

Historical Aspects

The genus name '*Crataeva*' is derived from *Crataevus*, a Greek botanist, while the synonym denotes its growth near places of worship. Varuna is mentioned in vedic literature, its therapeutic use being known to ancient ayurvedic physicians, specially as a blood purifier, to maintain homeostasis. The term for it '*rishadah*', means that which removes rust from metal, and burns bone.



Crataeva nurvala

Pharmacognosy

The macroscopic and microscopic properties of all parts of the plant have been described in much detail.

Phytochemistry

Triterpenoids lupeol and varunol have been isolated from root and stem bark. The water extract also contains tertiary and quarternery bases including choline. The leaves yield flavonoids including rutin, quercetin and isoquercetin.

Ayurvedic Properties

Guna: Laghu, Ruksha. *Rasa*: Tikta, Madhura, Kashaya. *Veerya*: Ushna. *Vipaka*: Katu. *Dosha*: Kaphavatahara, Shothaghna. *Karma*: Asma-Righna, Anulomana, Deepaniya, Krimighna, Grahak.

Pharmacology

The water extract of varuna bark reportedly, displays nicotinic actions on guinea pig ileum and dog tracheal muscle in vitro. The effects of this water extract on the bladder contractility of dogs has been studied by Deshpande *et al.* They found that the expulsive force of detrussor contraction increases under the influence of varuna. The alcohol ether extract of the bark has anti-inflammatory activity comparable to that of corticosteroids. Acute inflammations induced by histamine and carrageenin, and delayed (chronic inflammations (in formaldehyde induced arthritis) are both inhibited. The water extract of varun leaves displays antibacterial activity against *Shigella* and *Salmonella in vitro.*

Deshpande has studied the clinical use of varuna decoction on bladder emptying, chronic urinary infection and urinary electrolyte excretion. Varuna decoction reduces the urinary excretion of sodium and magnesium, shifting values from the lithogenic to the non-lithogenic zones. It was also found to increase the 'spontaneous' passage of renal and bladder calculi. In patients with prostatic hypertrophy, varuna decoction increases the force of detrussor contraction, reducing the volume of residual urine.

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This action, through which stagnation of urine is reduced, combined with its anti-inflammatory property, may explain the antiseptic action of varuna on the urinary tract.

Safety

The vesicant effect of topical application of freshly ground varuna leaves has been mentioned in ayurvedic literature. Decoction of stem and root bark are well tolerated.

Clinical Uses

In Ayurvedic practice, varuna is used as a litholytic agent, in treating *Kapha* and *Vata* varieties of ashmari (calcuii). It also clears crystalluria (sharkara). It is the drug of choice in all *kapha* disorders of the urinary tract, and in renal and bladder calculi. It is also used as a cholagogue, anti-helmintic and antiameobic in both intestinal and hepatic infestation. Its action as an anti-inflammatory agent is utilized in its use in deep-seated suppurative inflammations, in small joint, diseases and in osteomyelitis. It is also used as an antipyretic.

Indications

1. Urolithiasis and crystalluria.
2. Urinary tract infections.

Formulations

1. Leaf paste: Topical use.
2. Decoction of stem and root bark: 50 ml b.i.d.
3. Varunadi kwath: 50 ml b.i.d.
4. Varunadi ghritam (Ghee prepared from varuna bark and roots): 5-10 gms b.i.d.

Crataegus laevigata (Syn. *C. oxyaceae*)

(Family: *Rosaceae*)

Vernacular Name

Eng.–Midland Hawthorn.

Botanical Description

A deciduous shrub or small tree with grey thorny twigs. The leaves are alternate, obovate, shallowly lobed, serrate and leathery. The white to pinkish flowers are borne in erect corymbs. The fruit (haw) is a red, barrel-shaped pome with the remnants of the re-curved triangular sepals and two or three dry stigmas; it has two or three stones.

Habitat

Midland Hawthorn grows throughout Europe in woods, less often in hedgerows and scrub. In the British Isles it is locally common in southern and eastern parts of England and in Wales, but it is rare in northern England and Ireland and introduced in Scotland. The generic name, *Crataegus*, is derived from the Greek word *kratos* (= strong), a reference to the hardness of the wood. The common name, hawthorn, is a corruption of the Anglo-Saxon word *hagathorn, haga* meaning 'hedge'. The

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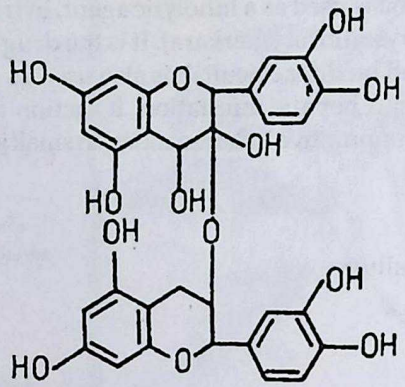
medicinal properties of Midland Hawthorn were known to the ancient Greeks. The plant is still widely used, especially on the Continent, for the treatment of hypertension.

Constituents

(-)Epicatechin and a dimeric procyanidin composed of cyanidin and epicatechin, isolated from fruits; leucocyanidin, m.p. 232°, isolated from fruits and leaves and its structure proposed; a polyphenolic compound, m.p. 180-200° and new protistocidine from flowers.

New Compounds



Leucocyanidin

Biological Activity

Protistocidine was toxic to *Tetrahymena pyriformis* and *Trichomonas vaginalis*. The polyphenolic compound had LD_{50} of 0.5 mg/kg in mice; it showed positive inotropic and negative chronotropic actions and abolished effect of acetylcholine on isolated frog heart. It acted as sedative in caffeine-excited mice.

Flavan polymer fraction, isolated from leaves, showed hypotensive activity in cats and strong and prolonged cardiotonic action in rabbit. The i.p. and s.c. LD_{50} values in mice were 130 and 300 mg/kg respectively; corulin (a mixture of corglycone, khellin and rutin) as well as extract of hawthorn had positive inotropic and negative chronotropic effects on isolated rabbit heart; a preparation obtained by acid treatment of aqueous extractive of leaves, fruits and flowers used against high blood pressure.

A black-red dye lake (probably a phlobaphene) prepared by acid treatment of extract of fruits, flowers and leaves, caused marked and protracted coronary dilation in Langendorff heart preparation of guinea pig; in dogs it increased coronary perfusion *in-situ* with slight increase of blood pressure; synergised the coronary dilation action of theophylline, hydroethyltheophylline, caffeine, papaverine, sodium nitrite, adenosine and adrenaline. (-)Epicatechin was mainly responsible for pharmacological action of the extract preparation.

Uses

The flowers (white forms only) have the strongest medicinal action. They are used on their own, or with the leaves; or the leaves are used by themselves. The main constituents of the flowers are the glycoside quercitrin with the sugar component quereetin, also flavones and traces of an essential oil. The leaves contain the flavonoid glycoside vitexin 4-rhamnosid, sterols and catechins. These substances give Midland Hawthorn hypotensive, vasodilating, antisclerotic and sedative properties and the

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plant is used for various heart and circulatory disorders such as high blood pressure, abnormal heart rate, arteriosclerosis and angina pectoris. Because of its effets on the heart *Midland Hawthorn should be used only under the supervision of a qualified medical or herbal practitioner*; no part is suitable for self-medication. The fruits have the same constituents as those of Hawthorn (*C. monogyna*).

Crataeva adansonii
(Family: *Capparaceae*)

Botanical Description

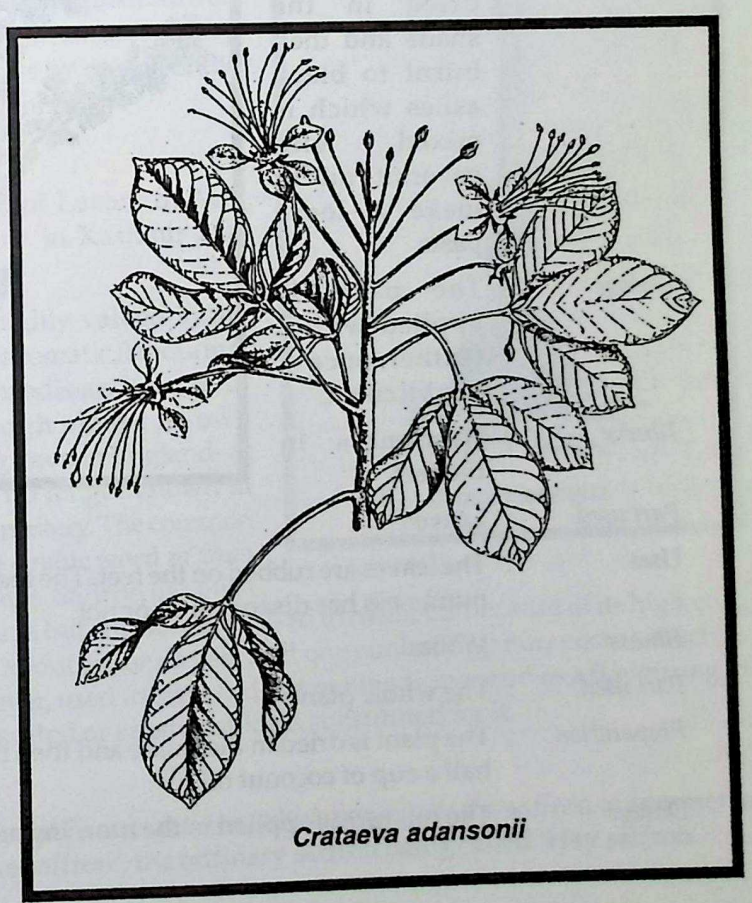
Deciduous trees, very similar to *C. nurvala* but can be distinguished by its ovate-lanceolate abruptly acuminate leaves.

Habitat

Occasionally found in the hills and plains of Southern India.

Uses

This is an important component of the *Varanadi gana* of Vagbhata, a group of seventeen drugs, which alleviates morbid *kapha*, obesity, weakness of the digestive fire, paraplegia (*adhya-rasa*), headache, *gulma* and *vidradhi* (malignant tumour). *Varuna* is astringent, bitter, acrid, anthelmintic, carminative, diuretic, laxative and stomach. It improves digestive power, purifies blood and cures arthritis internal abscesses dysuria, calculus, headache, certain heart diseases like angina pectoris and vaginismus. The drug is also useful in bladder and uterine affections and enlargement of the abdominal viscera. A decoction made out of the bark is a good remedy for renal calculus and hence the name *asmarighna*. Bark and leaves form a good external application for painful rheumatic swellings. *Varunadi kasayam, Prabhanjanam kulambu, Candrapratha gulika, Dhanvantaram ghrtam*, etc. are some of the preparations using the drug.



Crataeva adansonii

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Cressa cretica, Linn.

(Family: *Convolvulaceae*)

Vernacular Names

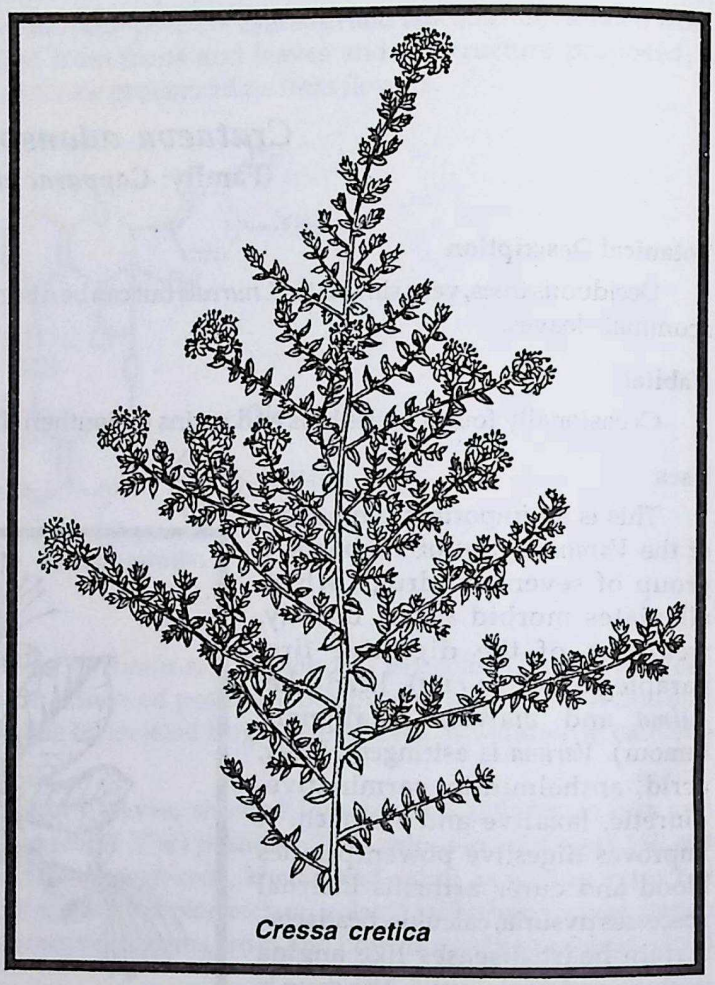
Hind. & Ben.–Rudranti; *Bom.*–Khardi; *Tam.*–Uppu-Sanaga; *Mah.*–Raanharbaraa.

Constituents

Alkaloid.

Action

Tonic, expectorant and anti-bilious.



Cressa cretica

Illness : **Scabies**

Part used : The whole plant

Preparation : The plant is dried in the shade and then burnt to black ashes which is mixed with coconut oil to make a loose paste.

Dosage : The paste is applied with a feather once a day till cured.

Illness : **Numbness in the feet**

Part used : Leaves

Uses : The leaves are rubbed on the feet. The feet are then scratched to note whether the numbness has disappeared or not.

Illness : **Wound**

Part used : The whole plant

Preparation : The plant is dried in the shade and then burnt. Half a cup of ashes is mixed with half a cup of coconut oil.

Dosage : The mixture is applied in the morning and evening till the wound has healed.

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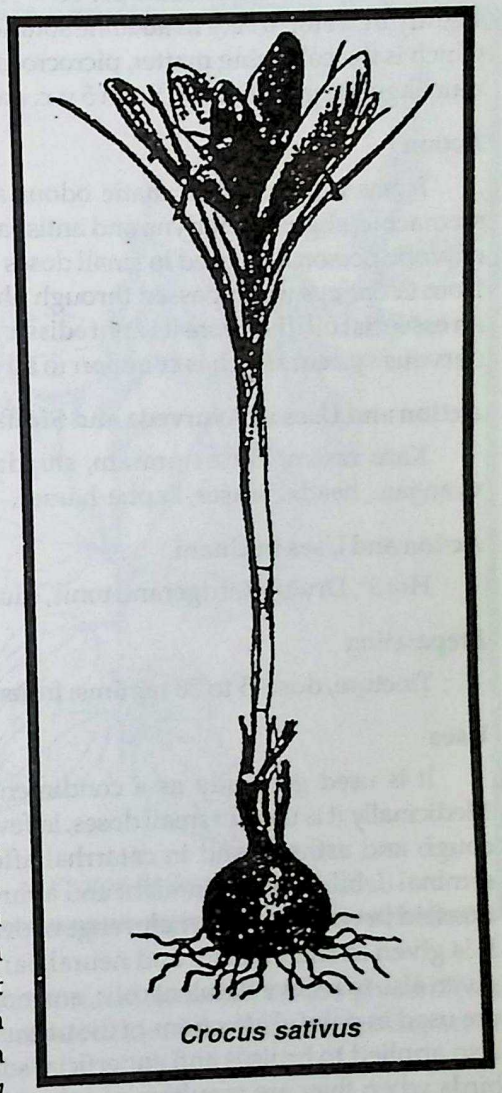
Crocus sativus, Linn.

(Family: Irideae)



Vernacular Names

Sans.–Bhavarakta, Saurab, Mangalya, Agnishikha, Kumkuma, Mangal, Kusrunam, Kashmirajanma; *Eng.*–Saffron; *Arab. & Pers.*–Zafrah, Zipharana; *Hind.*–Zaffran, Kesar; *Ben.*–Jafran; *Bom.*–Safran, Kessar; *Mah.*–Kecara; *Guj.*–Keshar; *Tel.*–Kunkuma-puvva, Kunkumma-purru; *Tam. & Mal.*–Kunkumappu; *Can. & Kon.*–Kunkuma-kesara; *Fr. & Ger.*–Safran.

Botanical Description

A perennial herb with a scaly underground corm and linear leaves with a pale midrib. The short scape is terminated by a large pale-violet, six-lobed, funnel-shaped flower. The yellow style is tipped with three orange stigmas that extend beyond the perianth. (The colour of the style, the three–not six–stigmas, and the shape of the leaves distinguish Saffron from the poisonous Meadow Saffron, *Colchicum autumnale*). The fruit is a capsule. Saffron also spreads by means of the cormlets that form on the base of the old corm.

Habitat

An autumnal dwarf herb a native of Levant in Asia Minor, now cultivated on a small scale in Kashmir and around Quetta.

Saffron has been cultivated and highly valued in the Middle East for at least 4,000 years as an aromatic flavouring, perfume, dye, medicine–even as an aphrodisiac. It has been so prized that at times it has been worth almost its own weight in gold. For a time Saffron was grown in England–at Saffron Walden in Essex. The plant is no longer known in the wild and its area of origin remains a mystery. The common name, Saffron, originally came from the Arabic word *za'faran* and refers to the orange-coloured stigmas. Saffron has been a cure-all remedy for a variety of ailments but it is now little used in medicine because of its high cost. Today the total world production only about 30 tons a year und one ounce (30 g) may cost as much as £50 on the retail market. It is still, however, used to taste and flavour medicines and as a flavouring in many culinary dishes. It is often adulterated or another spice is substituted for it.

Parts Used

Dried stigmas and tops of the styles of Crocus sativus, which constitute the saffron of commerce compressed into cakes and called 'cake saffron', the ordinary saffron being called 'Hay saffron.'

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Constituents

Three crystalline colouring matters-(1) α-crocetin ($C_{24}H_{28}O_5$ m.p. 272-273°) constitutes 0.7 per cent of saffron; (2) β-crocetin ($C_{25}H_{30}O_5$ m.p. 205-206°) constitutes 0.7% of saffron, and (3) γ-crocetin ($C_{26}H_{32}O_5$ m.p. 202-203°) constitutes 0.3 per cent. A volatile fatty oil, 8 to 13.4 per cent, Crocin-α glucoside soluble slightly in water, freely in alkaline solution and alcohol; and forming 65 p.c. of polcroit (many colours) which is the colouring matter, picrocrocein (bitter principle), wax, proteids, fixed essential 1.37 p.c. oil, mucilage, sugar (glucose?), ash 5 p.c. and moisture 12 p.c.

Action

It has a peculiar aromatic odour and a bitter, pungent taste, it is stimulant, aphrodisic and stomachic, slightly anodyne and antispasmodic; it has also emmenagogue virtues; in over-doses it is narcotic poison. It is used in small doses ¼ to ½ grain. Ordinary dose, is 1 to 3 grains. The essential oil from *C. Sativus* when passed through pharmacological tests showed all the characteristic features of an essential oil; therefore its aphrodisiac virtue is probably due to the slight stimulation of the central nervous system which is common to all essential oils.

Action and Uses in Ayurveda and Siddha

Katu rasam; Tikta-nurasam, snigdam, varnyam, tridosha-haram, in chardhi, vranam, krimi, vyangam, head diseases, kapha-haram.

Action and Uses in Unani

Hot 3°, Dry 1°, Refrigerant, tonic, diuretic, stimulant, for vision, tones the uterus, munzij-aesafra.

Preparation

Tincture, dose–5 to 20 minims; Infusion, (Saffron tea–1 in 80), dose–1 to 4 ounces.

Uses

It is used generally as a condiment for its aromatic odour and beautiful colouring matter. Medicinally it is used in small doses, in fevers, melancholia, enlargement of the liver and in spasmodic cough and asthma; and in catarrhal affections of children. It is given in anaemia, chlorosis and seminal debility. As a stimulant and aphrodisiac, it is considered to be a sovereign remedy, not to be excelled in virtue by the whole range of drugs in the Materia Medica. It gives the urine a yellow colour. It is given in rheumatism and neuralgia; and to children with ghee in looseness of the bowels. It is given also to relieve flatulent colic, amenorrhoea, dysmenorrhoea, leucorrhoea, etc. *Passaries of saffron* are used in painful affections of the uterus. *Externally* saffron is used in headache in the form of *paste*, also applied to bruises and superficial sores. It is an excellent palliative for haemorrhoids. To cage-birds when they are moulting or otherwise sickly, it is given a few threads being infused in water which they drink. Saffron is used in snake-bite also. Following preparation is very useful in chronic diarrhoea, chronic discharges and seminal weakness–Take of Saffron 2, Opium 2, cloves 4, *Safed miri* (dry white fruits of Piper Nigrum, deprived of their pericarps) 10, Henbane seeds 10, Pellitory root 10, balsam of Balsamodendron opobalsamum 1, Apium graveolens 1, dried ginger 2, Nux-vomia seeds 10, Gum resin of Euphorbia resinifera 12, Almond Oil 20 and Honey 20 parts. Make a confection. *Dose*–20 grs.

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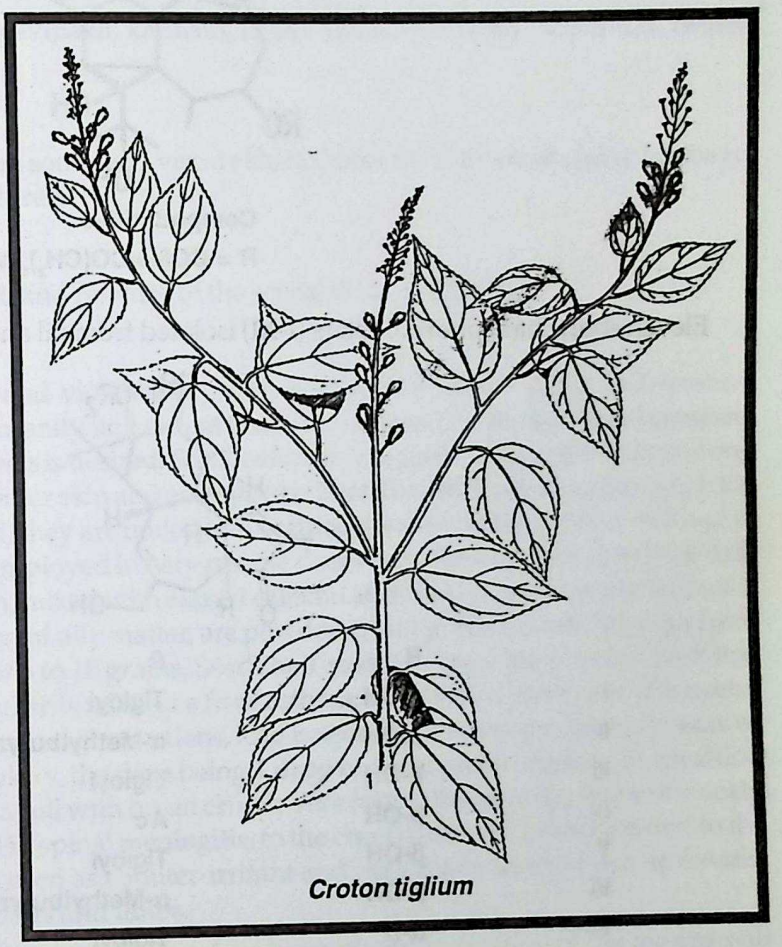
Croton tiglium, Linn.

(Family: Euphorbiaceae)



Croton tiglium

Vernacular Names

Sans.–Naepala, Jayapala, Kanakaphala, Titteriphala; *Eng.*–Purgative croton, Croton-oil seed; *Hind. & Duk.*–Jamalgota; *Bom.*–Geyapal; *Guj.*–Nepal; *Ben. & Punj.*–Jaipal; *Mah.*–Jeyapal, Mogli-erand, Arabi-erand, Nepalcha-bi; *Tel.*–Naepal-vaema, Nepala-vithalu, Nepalavitua; *Tam. & Mal.*–Naervalam, Chiduram, Valam; *Can.*–Japala beeja, Nepala; *Kon.*–Japal; *Arab.*–Hab-ul-salatina, Batu, Dand; *Pers.*–Bedanjir-e-khatai, Dund (Oil); *Eng.*–Croton oil; *Fr.*–Huile-dectiglium; *Ger.*–Krotonol; *Burm.*–Kanako; *Malay.*–Bori; Java.–Cheraken.

Habitat

Found throughout India, plentiful in Eastern Bengal extending to Assam and Burma.

Parts Used

Seed and fixed oil from the seed.

Constituents

Seed contains a fatty fixed oil tiglinic acid crotonic or quartenylic acid and croton oil. Fats present in croton oil are glycerides of stearic, palmitic, myristic and lauric acids and of several volatile acids of the same series like acetic, butyric, valerianic and tiglic acids. Croton oil is composed of:

1. Crotonoleic acid, whim appears to be the active principle
2. Tiglic acid or Methyl crotonic acid
3. Crotonol whim is non-purgative, but an irritant to the skin
4. Several volatile acids to whim the odour is due and
5. Several fatty acids.

Crotonoleic acid is a mixture of croton resin with inactive fatty acids.

Isolation, structure and semisynthesis of new highly active tumor-enhancing compound C-3 from seeds.

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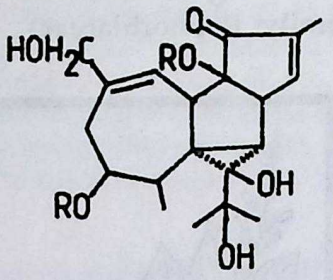
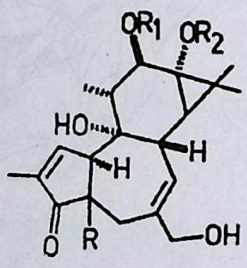
New Compounds



Compound C-3

R = COMe/CO$(CH_2)_{12}$Me

Eleven short chain phorbol esters (I-XI) isolated from oil and their structures elucidated.



	R	R_1	R_2
I	β-OH	Tigloyl	Isobutryl
II	β-OH	α-Methylbutyryl	Isobutryl
III	β-OH	Tigloyl	H
IV	β-OH	Ac	Ac
V	β-OH	Tigloyl	Ac
VI	β-OH	α-Methylbutyryl	Ac
VII	α-H	Tigloyl	Isobutyryl
VIII	α-H	Tigloyl	Ac
IX	α-H	α-Methylbutyryl	Ac
X	α-H	H	Ac
XI	β-OH	H	Ac

Action

Seeds, leaves, bark and root, all possess drastic purgative properties. Seeds are powerful drastic purgative and vermifuge; in over-doses it is an acro-narcotic poison. Oil is a powerful hydro-gogue cathartic and externally a vesicant producing irritation, inflammation, papular and pustular eruption. The activity of croton oil as a vesicant externally and as purgative internally is attributed to the presence of crotonoleic acid which is said to occur in the free state in which it is freely soluble in alcohol, and in combination as a glyceride. The glyceride does not possess poisonous properties, but the free acid acts as a powerful irritant to the skin and as a purgative in the intestines. The crotonal glyceride is attacked and split up like other glycerides by the ferments of the juices of the stomach and

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the crotonoleic acid is set free, which then exercises its purgative influence. A similar result may be obtained by administering crotonoleic acid as a pill enclosed in keratin. The drug is also a stimulant.

Action and Uses in Ayurveda and Siddha

Katu rasam, ushna-veeryam, katu-vipaka; kapham, krimi, vatam, udharam, dipanam, drastic purgative, blood diseases.

Action and Uses in Unani

Hot 4°, Dry 4°, purgative of balgham souda and viscid akhlath, dries the ruthoobath, gout, lumbago, balgham diseases, convulsions of children.

Preparation

Oil. dose–¼ to 1 minim; Liniment; and powder of the seeds; dose–2 to 5 grains.

Uses

It is given only when a drastic and violent purgative is required, as in dropsy and cerebral affections like apoplexy, convulsions, insanity, and ardent fevers etc., attended with high blood pressure, where complete evacuation of the bowels is desired. *Seeds*, before they are used, are boiled in cow-dung and water and after drying and their outer skin and embryo (the little leaf-like body found between the two halves of the kernel) are removed, they are boiled two or three times in milk and then enclosed in a raisin for administration. *Seeds* are employed in very minute doses in the form of *pills*, prepared with great care; the dose being ¼ to ½ grain, mixed with extract catechu and honey and gum acacia. Or, the seeds after being broiled and deprived of oily matter, are powdered and given mixed with equal part of powdered cumin seeds, in doses of 5 to 10 grains. Seeds half-roasted over a lamp or candle-flame and the smoke inhaled through the nostrils relieves a fit of asthma. *Expressed oil from the seed* is useful in dropsy, obstinate constipation, intestinal obstructions, lead poisoning, and as a preliminary laxative in leprosy and as a revulsive in apoplexy, the dose being 1 drop or 1 minim on sugar or in emulsion with sweet oil or butter or made into a pill with bread crumb. As a *blister*, the oil is applied to the scalp in acute cerebral diseases, to the cord in spinal meningitis, to the chest in chronic bronchitis and to the throat in laryngitis. The oil has been tried as counter-irritant and vesicant in rheumatism, synovitis, paralysis and painful affections of joints and limbs.

In lock-jaw and mania it is of great advantage; a few drops placed at the base of the tongue will produce catharsis. It is particularly valuable in cases where a minute and effectual dose is required; but it must not be resorted to except in cases where it is desirable that a speedy irritant action on the intestines should be produced, and in cases where the condition of the patient prevents him from swallowing. In minute doses it is given with fresh ginger tea to children in whooping cough. Should it cause griping, vomiting or too violent purging a good large draught of lime-juice is the best antidote, and it may be safely repeated in half an hour if the vomiting etc., continue. A useful liniment is made for external use, by mixing half an ounce of croton oil with 3 to 4 ounces of sesamum, coconut or other bland oil. For bronchitis and rheumatism a drachm of croton oil mixed with 12 drachms of mustard oil will form a good liniment; and for chronic rheumatism a mixture consisting of 1 part of the croton oil to 8 parts of coconut oil will form a suitable liniment. It will form a useful application also in asthma, gout, paralysis, neuralgia and acute laryngeal affections and arthritis.

Following Ayurvedic prescriptions are useful in the various diseases in which they are employed-

1. *Inchhavedivatica*: Take of mercury, sulphur, borax and black pepper, one part each, ginger three parts, croton seeds nine parts; rub them together with water and make into two-grain

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pills. These are given in fever with constipation as also in ascites and anasarca. (Rasendrasarasangrah).

2. *Rukkeshee Rasa*: Take of chebulic myrobalan five parts, croton seeds one part, soak them in the milky juice of Euphorbia nerifolia and make into four-grain pills. These are given with a decoction of the root of Ipomoea turpethum or Baliospermum montanum as a drastic, purgative in obstinate constipation–(Rasendrasarasangrah).
3. *Mahanaracha Rasa*: Take chebulic myrobalan, pulp of Cassia fistula, emblic myrobalan, root of Baliospermum montanum, Picrorrhiza kurroa, milky juice of Euphorbia nerifolia, root of Ipomoea Turpethum and the tubers f Cyperus rotundus each one tola; pound them to a coarse powder and boil in 4 seers of water till the latter is reduced to one-eighth. Then take a tola of husked croton seeds, tie them in a piece of thin cloth and boil them in the above mentioned decoction till the latter is reduced to the consistence of a fluid extract. To this extract add a powder composed of 8 parts of purified croton seeds, three parts of ginger and two of black pepper, mercury and sulphur, in quantity sufficient to make a pill-mass; rub them together for twleve hours and make into two-grain pills. These are given with cold water in tympanitis, colic, ascites sc. as a drastic purgative. After the operation of this medicine, rice should be given with curdled milk and sugar.

Toxicology

The seeds are said to be used in Java for killing fish, and the oil has been shown to have same effect upon the carnivora as upon man. When eaten, the seeds cause nausea and ecuctation, followed by flatulent distension of the abdomen, colic and diarrhoea. *A single seed is reported to have proved fatal.* The oil, in the dose of 1 drop, occasions more or less an acrid and burning sensation in the fauces and oesophagus, a sense of warmth in the stomach, nausea and sometimes vomiting. In an hour or two, some gurgling or slight colic is perceived in the bowels, followed somewhat suddenly by a watery stool with tenesmus, and heat about the anus. Within 24 hours eight or ten more stools follow, and there is but little general disturbance of the economy, except considerable weakness. Sometimes, instead of producing evacuations, the oil causes epigastric uneasiness and oppression, palpitation of the heart, headache, feverishness, perspiration and sleep. It would appear that the acrid principle of the oil is not the sole cause of its cathartic operation, for even after being thoroughly washed with alcohol and rendered mild to the taste, as well as incapable of pustulating the skin, it is still strongly purgative. No cases of poisoning by croton seeds, or oil in India appear to have been recorded. The drug is also used in snake-bite.

Cryptolepis buchanani or *Nerium reticulatum* Roxb.

(Family: *Asclepiadaceae*)

Botanical Description

Large, much-branched climber; leaves simple, opposite, oblong to elliptic, obtusely acuminate, 8-15 × 5-7 cm, glabrous green above, pale, whitish beneath; flowers creamy white in lax, few-flowered axillary cymes, calyx lobes 5, ovate-lanceolate, acute, corolla lobes 5, oblong-lanceolate acute; stamens 5, attached near the base of the corolla tube, filaments subconnate, anthers short, pollen masses cohering in pairs, ovary of 2 carpels; fruit of 2 divaricate, follicular mericarps.

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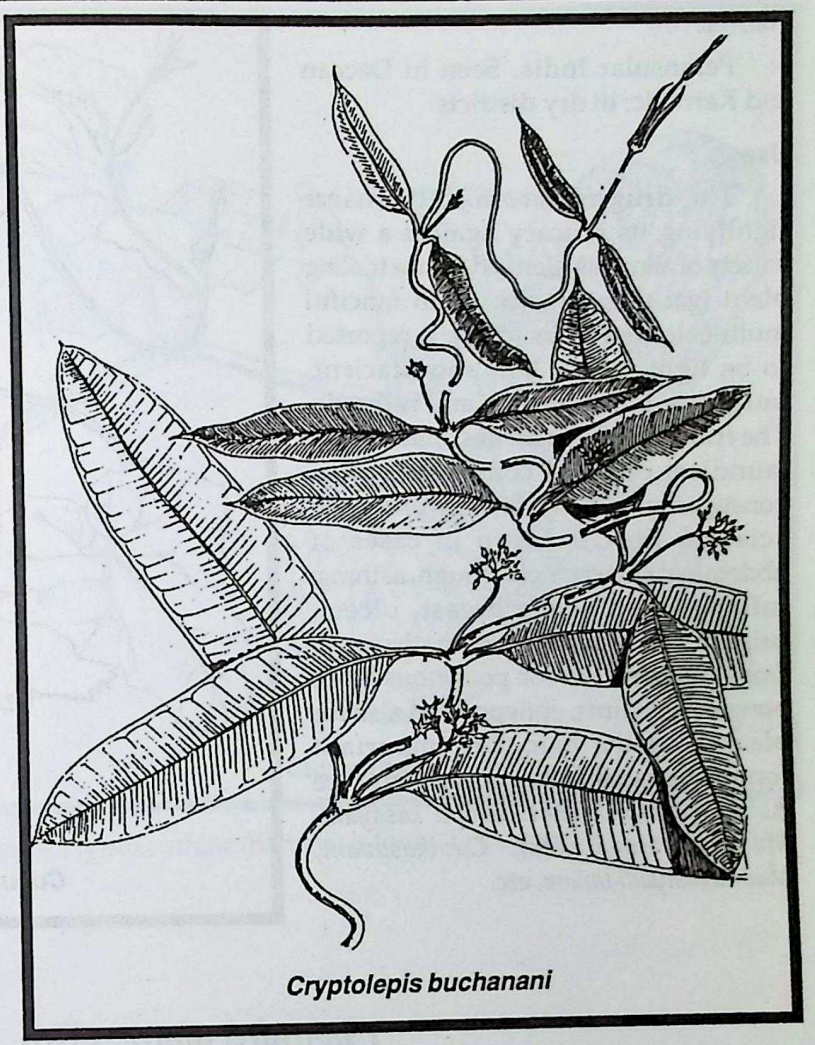
Habitat

Peninsula in India it is seen in N. Circars, Deccan, Carnatic and W. Coast in deciduous forests and in hedges.

Uses

Sariba, a well known drug of Ayurvedic materia medica, has been in wide use since ancient times. The tuberous root is reputed for its cooling and blood purifying action and is hence used to make refreshing drinks. The root is also alternative, aphrodisiac, refringerant, diuretic and tonic. It overcomes vitiated *vata*, *pitta* and *kapha* and cures dyspepsia, deficient digestive power, dysentery, cough, bronchitis, leucorrhoea, uterine haemorrhage, dysuria and blood diseases. The drug is useful in skin diseases, fever, thirst, vomiting, poisoning, chronic rheumatism, anaemia and debility. The important formulations using the drug are *Saribadyasavam*, *Pindatailam*, *Vidaryadi leham*, *Draksadi kasayam*, *Jatyadi ghrtam*, etc.



Cryptolepis buchanani

Cucumis callosus

(Family: Cucurbitaceae)

Botanical Description

Trailing herbs; branchlets hispid; leaves suborbicular, deeply 5-lobed, 3-4.5 × 2.5-3.5 cm, chartaceous, hispid, obovate. Male flowers in axillary few-flowered clusters, yellow; calyx hirsute, lobes linear; petals obovate, hirsute without; stamens 3, anthers flexuous, connectives apically prolonged, pistillode globose, 3-fid. Female: Calyx and corolla as in male; fruit smooth, globose, to 5 cm in diam, with green and white streaks.

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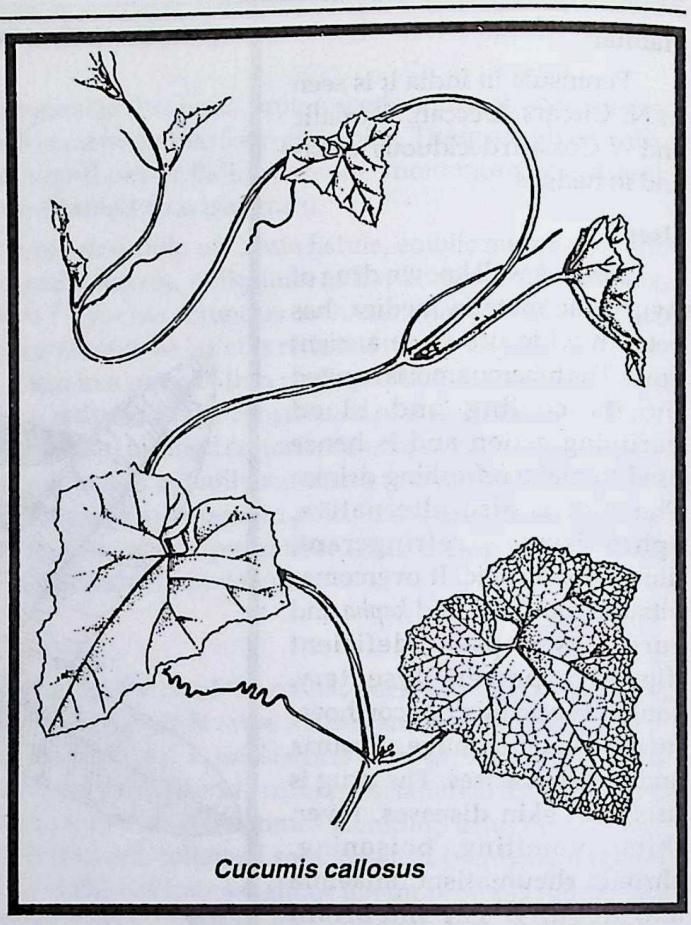
Habitat

Peninsular India. Seen in Deccan and Karnatic; in dry districts.

Uses

The drug *indravaruni* (the name signifying its efficacy against a wide variety of ailments) derived from a trailing plant (*gavaksi, gotumba*) with fanciful multi-coloured fruits (*citra*), is reported to be light, bitter, hot, abortifacient, purgative, blood purifier and cathartic. The fruit is useful in ascites, biliousness, jaundice, cerebral conjestion, colic, constipation, dropsy, fever, worms and sciatica. Root is given in cases of abdominal enlargement, cough, asthma, inflammation of the breast, ulcers, urinary diseases and rheumatism. Oil from seeds is used for poisonous bites, bowel complaints, epilepsy and also for blackening the hair. The important formulations using the root and fruit are *Abhayaristam, Mahatiktakam kasayam, Manasamitravatakam, Cavikasavam, Madhuyastyadi tailam*, etc.



Cucumis callosus

Cucumis melo, Linn.

(Family: Cucurbitaceae)

Vernacular Names

Sans.–Kalinga, Kharvuja; *Eng.*–Sweet or Musk-melon, Melon; *Hind. & Mah.*–Kburbuj, Sakkar Teti; *Sind.*–Gidro, *Mah.*–Valuk; *Ben.*–Khermuj; *Guj.*–Turbuch; *Tel.*–Velipandu; *Tam.*–Vaelapalam, Vellari-verai; *Can.*–Kalingada; *Kon.*–Bachang; *Fr.*–Cataloup; *Ger.*–Melonegurke.

Habitat

Extensively cultivated in gardens as well as in the sandy basins of rivers and found particularly in the North West and in Northern Bengal.

Uses

The fruit is eaten raw and cooked especially its pulp or *juice* forms a nutritive, demulcent, diuretic and cooling drink. It is beneficial as a *lotion* in chronic and acute eczema as well as tan and freckles and internally in cases of dyspepsia. Pulp mixed with cumin seeds and sugar-candy is a cool-diet in

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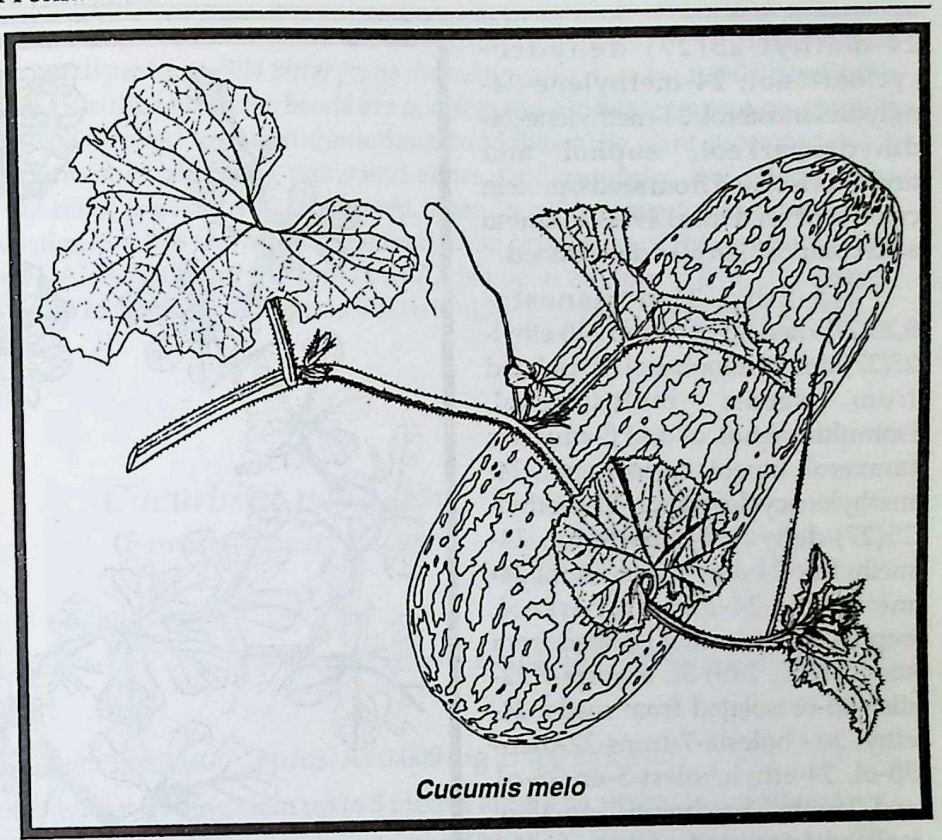
hot season. *Seeds* yield a sweet edible *oil* which is nutritive and diuretic, useful in painful discharge and suppression of urine. The same benefit is attributed to the seeds of all the species of Cucumis family. Pounded seeds and sugar-candy half a tola each, forms a nutritive diet. *Root* of the plant is found to contain emetic principle; therefore it has emetic and purgative properties. The composition of the seeds and other parts of the plants is similar to those of water-melon. The whole fruit is useful in chronic eczema, Hypoxanthine (Sarcine) is found to exist in this plant. Jacobabad in India is famous for this fruit.



Cucumis melo

Cucumis trigonus

(Family: Cucurbitaceae)

Vernacular Names

Eng.–Bitter gourd; *Sans.*–Vishala; *Hind.*–Bislambi, Jangli Indrayan; *Mah.*–Takmaki, Karit, Katvel; *Tam.*–Kattu-tumatti, Thummittikai, Hatt-ttumatti; *Tel.*–Adavi-puchcha, Kodinella; *Can.*–Hal-mekki, *Kon.*–Karanti.

Habitat

Found in the upper Gangetic plain, and the latter on the lower range of the western Himalayas.

Constituents

Cucurbitacin B isolated from fruits.

Linoleic acid (60-70%), lecithin, cephalin and cerebroside isolated from seed oil; multiflorenol, isomultiflorenol, α- and β-amyrins, taraxerol, lupeol, cycloartenol, 24-methylenecycloartanol,

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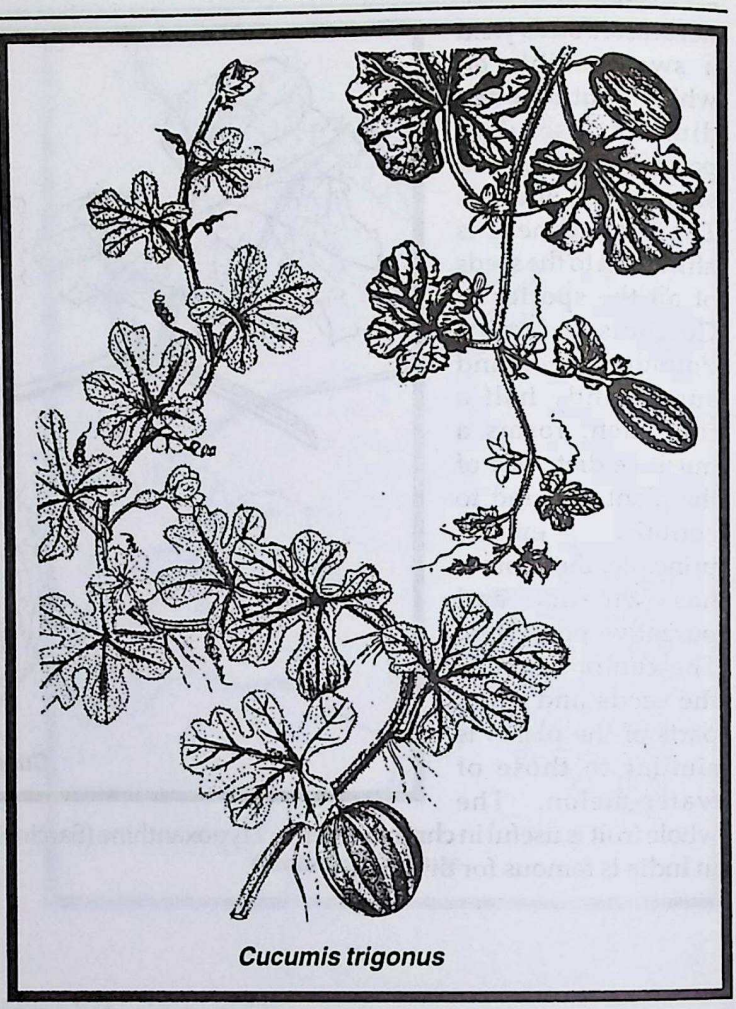
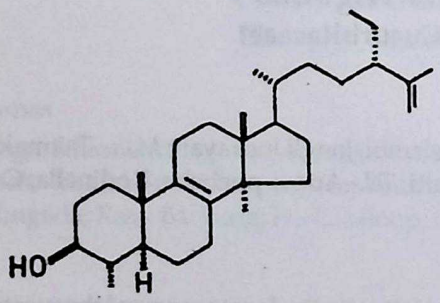
24-methyl-25(27)-dehydrocycloartanol, 24-methylene-24-dihydrolanosterol, 24-methylene-24-dihydroparkeol, euphol and tirucallol isolated from seeds; protein content of seed meal 49.93%; amino acid composition also determined.

24β-Ethyl-31-norlanosta-8,25(27)-dien-3β-ol (I) and 24β-ethyl-25(27)-dehydrolophenol (II) isolated from seeds; multiflorenol, isomultiflorenol, α- and β-amyrins, taraxerol, lupeol, cycloartenol, 24-methylenecycloartanol, 24-methyl-25(27)-dehydrocycloartanol, 24-methylene-24-dihydrolanosterol, 24-methylene-24-dihydroparkeol, euphol and tirucallol isolated from seeds; (22E, 24S)-5α-ergosta-7,22-dien-3β-ol isolated from seeds; 24-ethyl-5α-cholesta-7-trans-22-dien-3β-ol, 24-ethylcholest-5-en-3β-o1 and 24-ethyl-5α-cholest-7-en-3β-ol isolated from seeds, NMR studies revealed that they are mixtures of 24α- and 24β-epimers.

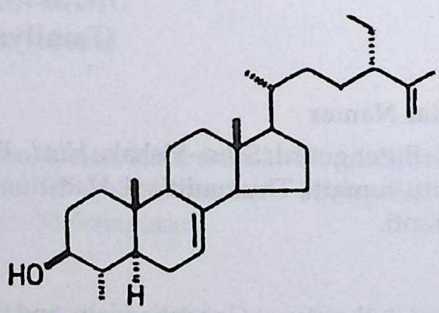


Cucumis trigonus

New Compounds



I



II

Uses

These plants occur in two distinct varieties; the wild bitter form (*Pahadi Indrayan* or hill colocynth) having smooth fruits with green and yellow streaks like colocynth, and the pubscent or semi-cultivated

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form with velvetty fruits which are sweet when ripe and are eaten as a vegetable when green. *Fruit* is appetiser and is useful in bilious disorders. *Wild bitter fruits are never eaten,* but are used sometimes medicinally in the same way as Citrullus vulgaris. Seeds are cooling and are beaten into a paste with the juice of Cynodon dactylon and applied to herpatic emotions. In Malabar the plant supposed to be alexipharmic and to have the power of removing pains and aches. Fruit pounded and boiled with cow's milk and applied to the head is supposed to prevent insanity, strengthen the memory and remove vertigo. Modern investigation has shown that the medicinal properties of this gourd do not differ from those of Colocynth. A decoction of the root (1 in 70) is useful as a purgative. It is stated to be milder in effect than the pulp of the fruit and causes less irritation. The drug is also used in snake-bite.

Cucurbita pepo, Dc.

(Family: *Cucurbitaceae*)

Vernacular Names

Sans.–Kurlaru; *Hind.*–Safed kaddu; *Ben.*–Shada kumra; *Bom.*–Kaula; *Tam.*–Pottai-gummadi.

Botanical Description

Seeds are anthelmintic. Leaves are used in burns. As 0.009 mg in 100 gm. fruit.

An annual cultivated herb with a trailing stem up to 5 metres long. The alternate, cordate leaves are very large and hairy. The long-stalked, large, height-yellow, star-shaped flowers are dioecious; the male flowers are in axillary clusters; the female flowers are solitary. The plant is in flower a long time and is an important source of food for bees. The fruit, a berry, is usually very large and hollow and contains flat, oval, white seeds in the watery fruit flesh.

Habitat

Vegetable Marrow is native to Central America where it has been cultivated for several thousand years. It is now grown all over the world as a vegetable for its oil and for fodder. There are many different varieties which produce fruit of all shapes and sizes. The specific name, *pepo*, is the Latin word for pumpkin and comes from the Greek *pepon* (= a large melon) as does the common name Pumpkin (formerly pompon or pumpion). The seeds have long been a safe and popular remedy for intestinal worms.

Constituents

Aqueous and alcoholic extracts of seeds possessed anthelmintic properties. Aqueous extract caused marked reduction in contraction amplitude and rate of frog heart which was not blocked by atropine.

Stigmasta-7,24(28)-dien-3β-ol (I) and stigmasta-7,25-dienol acetate isolated from seeds; euglobulins from seed was a mixture of three proteins.

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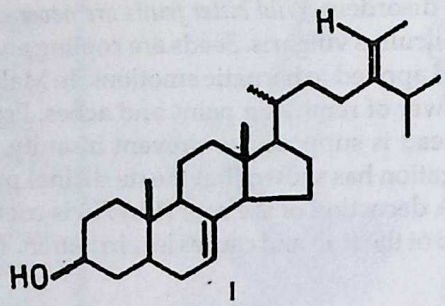
New Compounds



Seeds showed anthelmintic activity *in vitro* and *in vivo* against *Hymenolepis nana* and *Dicrocvelium dendriticum*.

Uses

The seeds contain upto 50 per cent fatty oil, proteins, a glycoside (cucurbitin), resin and substances yet to be identified. They are still used as an anthelmintic, dried, or eaten fresh (chewed or rounded) with the seed coat removed. They have no irritating side effects. A decoction from the dried seeds combined with castor oil can be used for the same purpose. The seeds of the related Cucumber (*Cucumis sativa*) are also anthelmintic. The fruits of Vegetable Marrow contain, besides water, sugars, proteins, a fatty oil, vitamins and minerals. They can be made into compotes and marmalade. The raw fruit juice is slightly diuretic and is sometimes recommended for urinary complaints.

Cuminum cyminum, Linn.

(Family: Umbelliferae)

Vernacular Names

Sans.–Ajaji, Jeeraka, Hrasvanga, Kunchika, Ajmoda, Jira; *Eng.*–Cumin seed; Caraway seed; *Hind. & Ben.*–Safed Jeera, Zira, Shiajira, Jira; *Sind.*–Zero; *Pers.*–Zeera, Zira; *Guj.*–Safed Jiraun, Zero; *Tel.*–Jeelakara, Jirana, Jiraka, Jilakharh; *Tam.*–Shimar-shombu, Cheerakum, Jeerakam, Shiragam; *Mal.*–Cheerakam, Jeerakam; *Can.*–Jeerigay; Kon. & *Mah.*–Jeera; *Arab.*–Kamun, Kammon; *Fr.*–Anisacre, Cumin officinal; *Ger.*–Venedischer Kummel.

Botanical Description

A biennial or perennial herb with a spindle-like taproot, finely divided (two or three times pinnate) feathery leaves and erect, branched, furrowed stems terminated by compound umbels of white or rose-tinted, deeply notched flowers. The fruit is an oblong, ribbed achene with two crescent-shaped seeds. All parts of the plant are aromatic.

Habitat

Extensively cultivated as a cold-season crop on the plains and as summer crop on the hills of Northern India, Himalayas and the Punjab, Baluchistan, Kashmir, Kumaon, Garhwal, Chamba, etc. also imported from Persia and Asia Minor (Eastern Europe).

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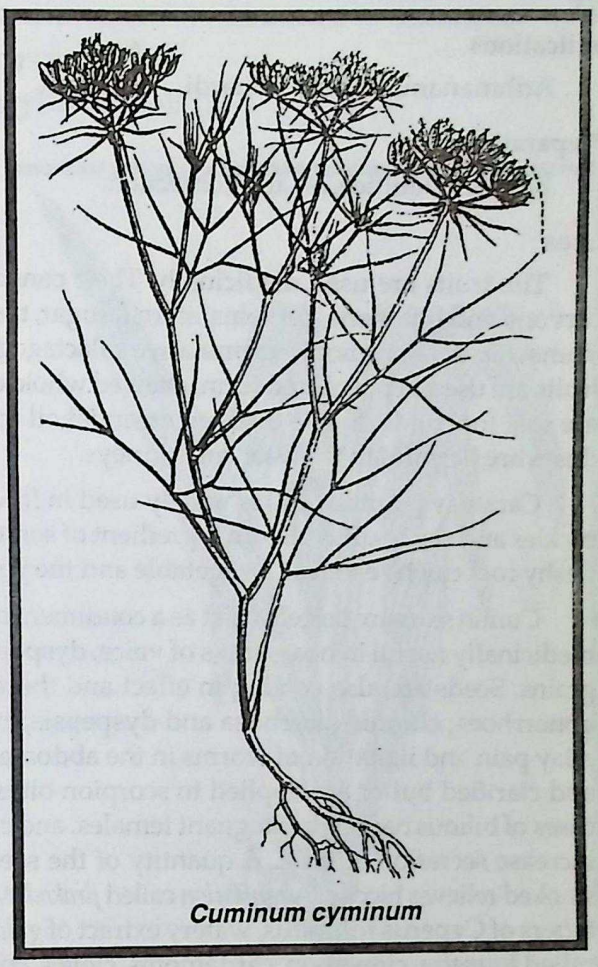
Cuminum cyminum

Caraway grows throughout Europe and Asia in grassy, sunny places, especially in mountains up to 2,000 metres. It is probably not native to the British Isles, but it is locally established in meadows in Scotland, especially in the extreme north. Elsewhere it is usually a casual on waste ground. It may have been introduced in the 16th century. It is widely cultivated for its seeds on the Continent. In Britain most supplies of Caraway are imported. The plant was known in ancient times as a culinary herb and as a remedy for indigestion. It was also believed to promote milk flow in nursing mothers.

Parts Used

Fruit or seed; essential oil.

Constituents

Fatty oil, resin, mucilage, gum; protein compounds, malates and an essential oil to which the aromatic odour and taste is due. A valuable essential oil 'thymene' rich in 'carvone' obtained from the seeds, contains cuminol or cumic aldehyde 56 p.c. a mixture of hydrocarbons, cymene or cymol, terpene, etc. Thymol occurs in fairly large proportions in the oil of ajowan, which is distilled from the fruits in India. This essential oil is colourless.

p-Cymene and cuminaldehyde identified in seed essential oil by GLC; lipids (10.5%) isolated from seeds contained hydrocarbons (0.2), triacylglycerols (66.0), waxes (0.1), free fatty acids (5.1), free alcohol (tr.), sterols (0.4) and chlorophyll (0.1%); petroselinic acid in both free and esterified form also present in seeds, or, pale-yellow with a strong odour and flavour of the fruit. The yield varies from 3.5 per cent to 5.2 per cent according as the entire seeds or the coarsely ground seeds are distilled. If it is intended to produce a freely alcohol soluble oil with especially high 'carvone' content, the whole seed must be used. Oil distilled from wild caraway seeds usually shows a high specific gravity and hence is not much preferred.

Action

Seeds are carminative, aromatic, stomachic, stimulant and astringent. Seeds are cooling in effect.

Action and Uses in Ayurveda and Siddha

Katu-rasam, ushna veeryam, vata-kapha haram, pittakaram, ruksham, lagu, dipanam grahi, medhyam, ruchyam, vathanulomanam, vrishyam, pachanam, balyam, chakshushyam.

Action and Uses in Unani

Hot 2", Dry 3", in cold and balgham diseases, astringent, carminative, liquifies matter, digestive, hiccough, enlarged spleen, diuretic, emmenagogue.

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Indications

Adhmanam, Gulman, Chardi, Athisaram.

Preparation

Powder, poultice, oil and confection.

Uses

The fruits are used medicinally. Their constituents include an essential oil (3-5 per cent) with carvone and limonene, proteins, starch, sugar, tannins and fatty oil. These substances give Caraway stomachic, antispasmodic, carminative galactagogic, antiseptic and anthelmintic properties. The dried fruits are used in powdered form, chewed whole or they are crushed and made into an infusion. They are safe for children. The distilled essential oil (caraway oil) is also an effective treatment but large doses are harmful to the liver and kidneys.

Caraway (fruits or oil) is widely used in flavouring food products such as bread meat, cheese, pickles and sauces. It is also an ingredient of some alcoholic beverages such as Kummel and gin. The fleshy root can be eaten as a vegetable and the young leaves added to salads and soups.

Cumin *seeds* are largely used as a condiment or spice in curries, pickles etc. *i.e.* in cookery; they are medicinally useful in hoarseness of voice, dyspepsia and chronic diarrhoea; the dose is from 10 to 30 grains. Seeds are also cooling in effect and therefore form an ingredient of most prescriptions for gonorrhoea; chronic diarrhoea and dyspepsia; *externally* they are applied in the form of *poultice* to allay pain and irritation of worms in the abdomen; seeds reduced to *powder*, mixed with honey, salt and clarified butter are applied to scorpion bites. Seeds mixed with lime juice are administered in cases of bilious nausea in pregnant females, and cumin seeds taken *internally* shortly after child-birth increase secretion of milk. A quantity of the seed, lightly smeared with ghee, put into a pipe and smoked relieves hiccup. A *confection* called *jirakadi Modaka* is prepared thus-Take of the three myrobalans, tubers of Cyperus rotundus, watery extract of *gulancha*, prepared talc, flowers of Mesua ferrea, leaves called *tejapatra*, cinnamon, cardamoms, cloves, coriander, ginger, long pepper, Oldenlandia herbacea root of Andropogon muricatum, Pavonia odorata and Plumbago zeylanica, each one part, cumin seeds, nineteen parts or equal in weight to all the other ingredients; powder them all and mix. Add two parts of sugar to one of the powder and make into a confection with honey and clarified butter. Dose-one drachm. This medicine is prescribed in chronic diarrhoea and dyspepsia with loss of appetite. (Cumin seeds resemble those of coraway but they are larger and of a paler colour; caraway seeds are used as carminative during convalescence after diarrhoea.) *Cumin Oil* can be readily converted artificially into thymol; thymol is used as an anthemaintic against hookworm infections and also as an antiseptic, forming part of many proprietary preparations. Oil distilled from wild caraway seeds is sparingly used in medicine, but finds ready employment in flavouring wines, scenting soaps and in perfumery. An *oil* known as *Jirakadya taila* used in eczema is made thus—Take of powdered cumin seeds, eight tolas, minium or red lead four tolas, prepared mustard oil three seers, water twelve seers, boil them together in the usual way for the preparation of medicinal oils-(Bhavaprakasa). The following powder is given in gonorrhoea and high-coloured urine—Take of Cuminum cyminum 4 parts. Calamus draco (Dragon's blood) 2 parts, Nitrate of potash 5 parts, Coriander seeds 5 parts and Rose buds 2 parts. Mix and make a powder. *Dose*: 20 grs. This drug is used in snake-bites also.

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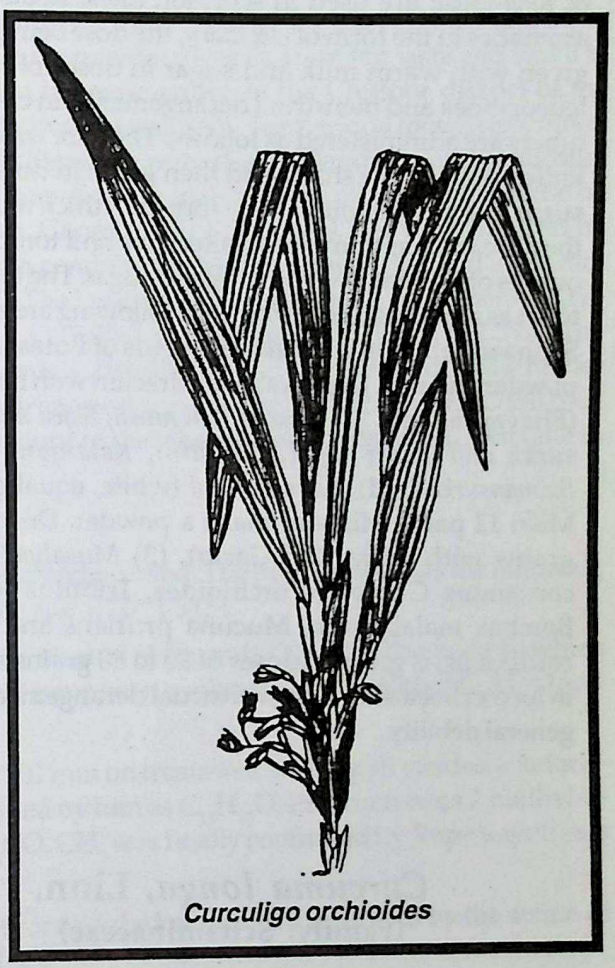
Curculigo orchioides
(Family: Amaryllidaceae)


Curculigo orchioides

Vernacular Names

Sans.–Hemapuspi, Talamulika, Musali; *Eng.*–Black musale; *Hind. & Guj.*–Musalikand, Kalimusli; *Gwalior.*–Mussulkund; *Ben.*–Talamuli, Sadamusli; *Tel.*–Naelatadi-chettu or gadda; *Tam.*–Nilap-panaik-kizhangu, Nilappanang-Kilangu; *Mal.*–Nellapana Kilongu; *Can.*–Neladali; *Mah. & Kon.*–Bhuyimaddi; *Pers.*–Mosali; *Sinh.*–Hin-bin-tal.

Habitat

Occurring wild in sandy situations of hotter regions of India and Ceylon. N.B.–C. *orchioides* is the *'kala-musli'* (black variety) of the bazar and has to be distinguished from the tuberous root of *Asparagus adscendens* which goes by the name of *'Safed musli'* (white variety).

Parts Used

Tuberous roots; bulbs.

Constituents

Resin, tannin, mucilage, fat, starch and ash containing oxalate of calcium etc. Root contains a good deal of mucilage.

Detection of palmitic, oleic, linoleic, linolenic, arachidic and behenic acids in root oil by TLC-GC; 3-methoxy-5-acetyl-31-tritriacontene isolated from roots; 2-methoxy-4-acetyl-5-methyltria-contane from roots.

Action

Bitter aromatic tonic, demulcent, diuretic and restorative. Roots are alterative and tonic.

Action and Uses in Ayurveda and Siddha

Seeth veeryam, polyuria, white leprosy, aphrodisiac, prameham with constant discharge. (Therapeutia Notes).

Action and Uses in Unani

Hot 2°, Dry 2°, Aphrodisiac, tonic, nervous diseases, reeh. (Trerapeutic Notes).

Preparation

Confection and powder.

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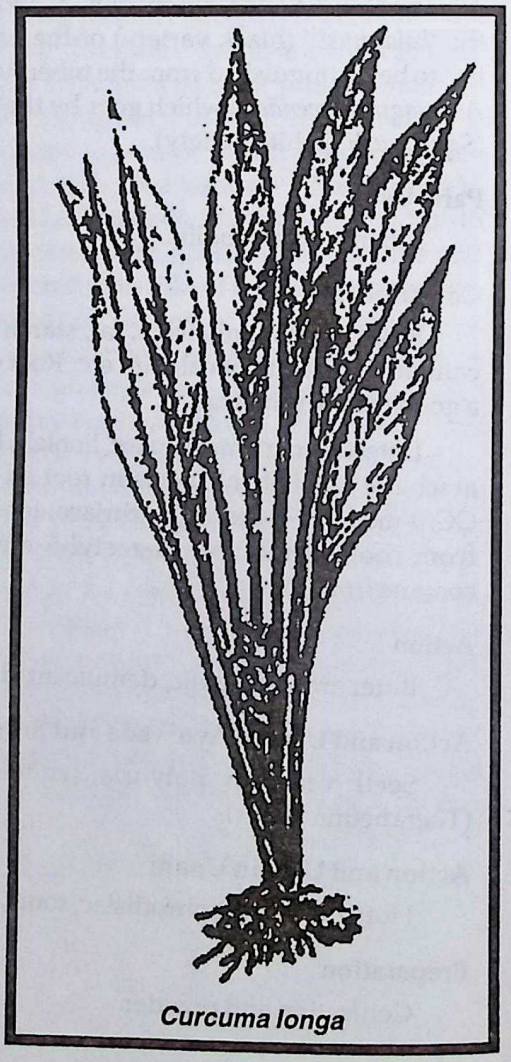
Uses

Tuberous roots constitute the (black) *kala-musli* and the white variety *safed-musli* of the bazar. Bulbs of *Kala-musli* are used in scorpion bites. Roots are prescribed usually combined with bitters and aromatics in the form of *electuary*, the dose being one tea-spoonful twice a day; sometimes the drug is given with warm milk and sugar in doses of two drachms in gonorrhoea, dysuria, menorrhagia, leucorrhoea and menstrual derangements. In cases of piles, asthma, jaundice, diarrhoea and colic, the tubers are administered as follows: They are washed and freed from rootlets, cut in slices by a wooden knife, dried in the shade and then given in doses of 180 grains beaten up with an equal quantity of sugar in a glass of milk in the form of a thick mucilage. As the roots contain a good deal of mucilage they are used as demulcent, alterative and tonic during convalescence after acute illness; dose-1 to 2 ounces of the root in warm milk and sugar. The tuber forms an ingredient of several medicines intended to act as aphrodisiacs of which the following are examples-(1) Take of the root of Asparagus racemosus, Saphaeranthus mollis, *gulancha*, seeds of Butea frondosa, and the tuberous roots of *musali* equal parts; powder and mix. Dose is about a drachm with honey or clarified butter useful in the debility of old age. (Bhavaprakash). (2) Take of *Kali musli, Safed musli, Salebmisri*, Talmakhana, *Bijbund, Inderjava, Tudri surkh and Tudri safed, Dalchini, Kalanjan, Sakakul, Baimansurkh* (red), *Baiman-safed* (white, equal parts and Misri 12 parts. Mix and make a powder. Dose-45 to 90 grains with milk-(Zad-Garib), (3) *Musalyadi Churna* containing Curruligo orchioides, Tribulus terrestris, Bombax malabricum, Mucuna pruriens and Coculus cordifolius, is given in doses of 20 to 60 grains with milk in luecorrhoea and other menstrual derangements due to general debility.



Curcuma longa

Curcuma longa, Linn.
(Family: Scitaminaceae)

Vernacular Names

Sans.–Rajani, Gauri, Varnavat, Haridra, Nisha; *Eng.*–Saffron, Turmeric; *Hind., Duk. & Punj.*–Haldi; *Kash.*–Lidar; *Ben.*–Halud; *Mah. & Kon.*–Halad; *Guj.*–Halder, Halada; *Pers.*–Serd-Chubah, Zard-chobah, Daraserda; *Arab.*–Zirsud, Uruk-es-suff, Kurkum; *Tel.*–Pasupu, Haridra; *Tam. & Mal.*–Manjal; *Can.*–Haldi, Arasina; *Sinh.*–Haradul, Khaka; *Burm.*–Tanum; *Malay.*–Kooneit; *Fr.*–Curcuma long.

Habitat

Extensively cultivated all over India. In Bombay Presidency there are two varieties (1) with hard rich-coloured oval rhizomes, chiefly used in dyeing, known as *'lokhandi halad,'* and the other with softer, larger, lighter-coloured long rhizomes which are usually used for eating.

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Parts Used

Tubers and rhizomes.

Constituents

An essential oil 1 p.c., resin, an alkaloid, curcumin–the yellow colouring matter, turmeric oil or turmerol. Turmeric oil is a thick, yellow, viscid oil. Curry powder owes its aromatic taste and smell to this oil. Turmeric Oil obtained by distilling in steam turmeric grown in the Chittoor district of the Madras Presidency was examined. The yield of the oil obtained was 5.8%. Turmeric oil though examined several times since 1868, the constituents recorded in literature were-d-a phellandrene and an alcohol called turmorol of formula $C_{13}H_{18}O$ or $C_{14}H_{20}O$. A systematic examination of the oil revealed that the oil did not contain any phenols, aldehydes or ketones. Caproic acid $C_6H_{12}O_2$ (0.1%) was found to be present as free acid while valeric $C_5H_{10}O_2$ (0.1%) as a combined acid. The oil was distilled at 20 mm into various fractions ranging between 70° to 180°C. The lower fractions contained d-sabinene $C_{10}H_{16}$ (2.0%), d-a-phenandrene $C_{10}H_{16}$ (4%), Cineol $C_{10}H_{18}O$ (3.0%) and d-Borneol $C_{10}H_{17}OH$ (2.5%). The middle fractions were sesquiterpene hydrocarbons mainly Zingiberene $C_{15}H_{24}$ (30.5%) while the higher fractions were mixtures of the sesquiterpene hydrocarbon and sesquiterpene alcohol $C_{15}H_{20}O$ (50.5%). Considerable changes in optical rotations in the fractions of the whole oil were observed from time to time.

Formation of Curcumone from Turmerol

A sesquiterpene alcohol $C_{15}H_{26}O$ has been isolated and purified. The pure alcohol has the following constants: Boiling point 163.4°/II mm, d 30° 0.9506; and n 30° 1.5151.

Turmerol is a monocyclic tertiaty sesquiterpene alcohol of formula $C_{15}H_{26}O$. The body to which the formula $C_{13}H_{18}O$ or $C_{14}H_{20}O$ was assigned might have been a mixture of the alcohol $C_{15}H_{26}O$ and the hydrocarbon $C_{15}H_{24}$.

Rupe in 1909 found that the fraction 158°–162°/II mm on treatment with alkali yielded a ketone-curcumone $C_{13}H_{18}O$ which formula was later modified by him as $C_{12}H_{16}O$. Its structure as 2-methyl-2-p-toyl-methyl ethyl ketone $CH_3C_6H_4\ CH(CH_3)\ CH_2CO.\ CH_3$ was finally confirmed by Rupe's synthesis in 1924.

It has been shown that the original oil does not contain the ketone but it is formed by the action of alkali on the alcoholic constituent 'turmerol' $C_{15}H_{26}O$.

Turmerol on dehydrogenation with sulphur and selenium gave neither cadalin nor eudalin.

During catalytic reduction with platinum black and hydrogen, termerol was converted into a saturated alcohol $C_{15}H_{30}O$ showing the presence of two double bonds.

The alcohol on oxidation with dilute nitric acid yielded p-toluic, terephthalic and oxale acids.

On oxidation with aqueous $KMnO_4$ as well as with powdered $KMnO_4$ in acetone solution, turmerol gave an acid of meeting point 42°–43°, equivalent 178 and molecular formula $C_{11}H_{14}O_2$ perhaps identical with the acid obtained by Rupe by oxidation of curcumone. Curcumic acid $C_{11}H_{14}O_2$ melting at 42°–43° has the structural formula as p-methyl-3-methyl-hydrocinnamic acid $CH_3C_6H_4CH(CH_3)\ CH_2COOH$.

d-α-Pinene, bp.155°/176 mm, d-camphor, m.p. 175°,1-β-curcumene as m.p. 83°, d-curcumene, m.p. 115°, phytosterol and an unidentified compound m.p. 142°, from rhizomes.

Curcumin, m.p. 182°, isolated from rhizomes.

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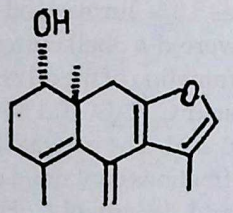
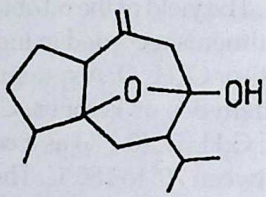
Isolation and structure of new sesquiterpenoid–curcumol, m.p. 141° from rhizomes; another sesquiterpenoid–zederone–isolated and its structure elucidated; zedoarone, m.p. 104°/3 mm., isolated and found identical with curzerenone; a furanodiene (I), m.p. 44°, from rhizomes; curcolone isolated, its structure and absolute configuration determined; structure of curcumenol; sesquiterpenoid–pyrocurzerenone, m.p. 76° from rhizomes.

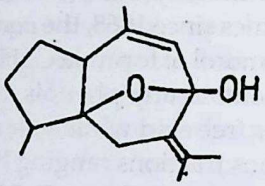
New Compounds



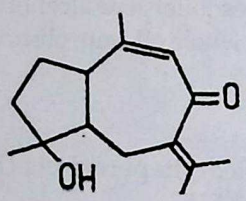
Curcolone



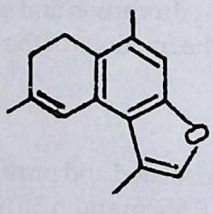
Curcumol



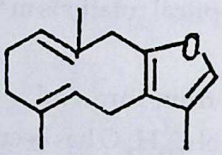
Curcumenol



Procurcumenol



Pyrocurzerenone



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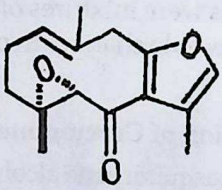


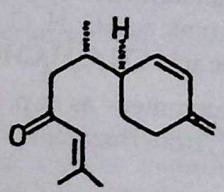
Zederone

Detection of α- and β-pinenes, (-)ar-curcumene, (+)camphor, (+)α-terpineol, (+)borneol and zingiberol in rhizome oil by GC.

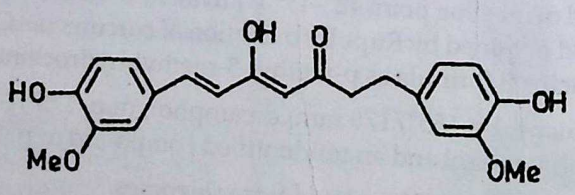
Camphene, α- and β-pinenes, 1,8-cineole, isofuranogermacrene, borneol, isoborneol, camphor, germacrone and tetramethylpyrazine isolated from rhizomes; isolation of antiarrhythmic compound, dipotassium magnesium dioxalate, from bulbs.

Dihydrocurcumin from rhizomes; diferuloylmethane, feruloyl-p-coumaroylmethane and di-p-coumaroylmethane isolated from rhizomes; synthesis of curcumone and ar-turmerone; isolation and structures of α- and β-turmerones; α- and β-pinenes, camphene, limonene, terpinene, caryophyllene, curcumene, linalool, turmerone, ar-turmerone, borneol, isoborneol, camphor, eugenol, cineole, curdione, curzerenone, curcumin, monodemethoxycurcumin and didemethoxycurcumin identified in rhizomes; isolation of curlone from rhizomes and its structure elucidation; curcumins I, II and III isolated from defatted rhizomes.

New Compounds



Curlone



Dihydrocurcumin

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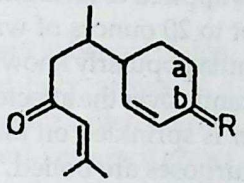

α-Turmerone
a b = Δ, R = Me,H
β-Turmerone
R = CH_2

Biological Activity

Diferuloylmethane, feruloyl-p-coumaroylmethane and di-p-coumaroylmethane showed cytotoxic activity; curcumin showed significant anti-inflammatory activity. Curcumin (100 mg/kg) administered orally for 6 consecutive days produced gastric ulceration in albino rats due to marked reduction in mucin content of gastric juice; single dose of curcumin (100 mg/kg, orally) was completely eliminated from body within 8 hr in rats. About 74% was absorbed during first 5 hr and 25% was eliminated in faeces. Its major metabolite in urine was curcumin glucuronide.

Action

Aromatic, stimulant tonic and carminative. Internally juice is anthelmintic.

Action and Uses in Ayurveda and Siddha

Katu tikta rasam, veeryam, ruksham, varnyam, in prameham, pandu, rakta-dosham, krimi, vranam, pinasam.

Action and Uses in Unani

Hot 3°, Dry 3°. Removes liver obstruction dropsy, jaundice; externally used for ulcers and inflammation. (Therapeutic Notes).

Preparation

Powder, Paste, Ointment, Oil, Lotion, inhalant and Confection.

Uses

Rhizomes are boiled, dried and made into powder, which gives a yellow colour and which is employed largely as a colouring agent and as condiment entering largely into the composition of Indian pickles and curry powders. *Juice* of the fresh rhizome is applied to recent wounds, bruises and leech-bites. *Internally* it is used as an anthelmintic. *Root* is usefully administered in intermittent fevers. In doses of 15 to 20 grains, twice a day it is given for flatulence, dyspepsia and weak state of the stomach; it is used both externally and internally in skin diseases due to impurity of the blood. A *paste* of turmeric and the leaves of Justicia adhatoda with cow's urine is rubbed on the skin in prurigo (Chakradatta). Several other combinations of the sort are in vogue, such as turmeric and *neem* leaves, turmeric and the ashes of the plantain tree, etc. Turmeric is also given internally with cow's urine in prurigo and eczema. Mixed with gingelly oil it is applied to the body to prevent skin eruptions. Turmeric paste mixed with a little lime and saltpetre and applied hot is a popular application to sprains, bruises, wounds, and inflammatory troubles of the joints. In small-pox and chicken-pox a

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coating of turmeric *powder* or *thin paste* is applied to facilitate the processes of scabbing, and *decoction* of turmeric (1 ounce of the bruised root to 20 ounces of water) is applied as a lotion to relieve the burning in catarrhal and purulent opthalmia popularly known as 'country sore eye', and conjunctivitis. A piece of rag soaked in it, and kept constantly over the affected eye relieves the burning and moderates the urgency of the symptoms. Its *powder* is sprinkled on ulcers to stimulate them to healthy action. Tubers sold in the market for dietary purposes are boiled, and are on no account used for dyeing. Turmeric for dyeing is sold separately and Indian women use it to smear their hands and faces with and is called in Tamil '*Kappumanjal*'. *Ghee* mixed with powdered turmeric, is given to relieve cough. A paste of turmeric alone or combined with the pulp of *neem* leaves is used in ringworm, obstinate itching, eczema and other parasitic skin diseases. In piles an *ointment* made of turmeric, hemp leaves, onions, and warm mustard or linseed oil gives great relief when the piles are painful and protruding also effective in eczema, itches, etc. In pemphigus and shingles the part first smeared with a thick coating of mustard oil and then dusted on with turmeric powder is cured within 3 or 4 days. In catarrh and coryza the *inhalation of the fumes* of the burning turmeric from the nostrils causes a copious mucous discharge and gives instant relief; the *fumes* are also used to relieve hysterical fits. The inhalation is taken at night and no fluid is allowed for some hours afterwards. *Smoke* produced by sprinkling powdered turmeric over burnt charcoal will relieve scorpion sting when the part affected is exposed to the smoke for a few minutes. Turmeric and alum powder in the proportion of 1 to 20 is blown into the ear in chronic otorrhoea. With borax as a *paste* it is applied to reduce indolent swellings. It is given in urinary diseases. *Milk* boiled with turmeric rhizome added to it, and then sweetened with sugar is a popular remedy for cold. *Internally* turmeric is given in affections of the liver and in jaundice. Following *powder* is a good digestive-Take of turmeric, long pepper, ginger, cardamoms, ten grains each in powder and black pepper powder five grains. Mix well and make a compound powder. Following confection is highly recommended in obstinate skin complaints-*Haridrakhanda*-Take of turmeric 64 tolas, clarified butter 48 tolas, milk 16 seers; sugar 17 tolas and boil them together over a gentle fire in an earthern pot. Then add black pepper, long pepper, ginger, cinnamon, cardamom, *tejapatra*, *baberang* seeds, root of Ipomea, Turpethum, the three myrobalans, Bowers of Mesua ferrea, tubers of Cyperus rotundas and prepared iron, each 8 tolas in fine powder and prepare confection. *Dose*-one tola every morning in prurigo, boils, urticaria and chronic skin eruptions-(Bhaishajyratnavali). A cure is effected in 7 days.

Tests-Good turmeric should be of a reddish orange appearance when broken or cut in two and should also have a moist feeling.

Cuscuta reflexa, Roxb.

(Family: Convolvulaceae)

Vernacular Names

Sans.–Amaravela; *Eng.*–Dodder; *Ben.*–Algusi, Haldi-algusilata; *Punj.*–Nilathari, Viradhar, Amil, Zarbuti (seeds); *Gwalior.*–Amarbel; *Hind. & Punj.*–Akasbel, Aftimum, Kasus; *Duk.*–Akas-pawan, Amalwel; *Guj.*–Akaswel; *Mah.*–Nirmuli; *Tel.*–Sitama purgonalu; *Pers.*–Tukhm-i-kasusa.

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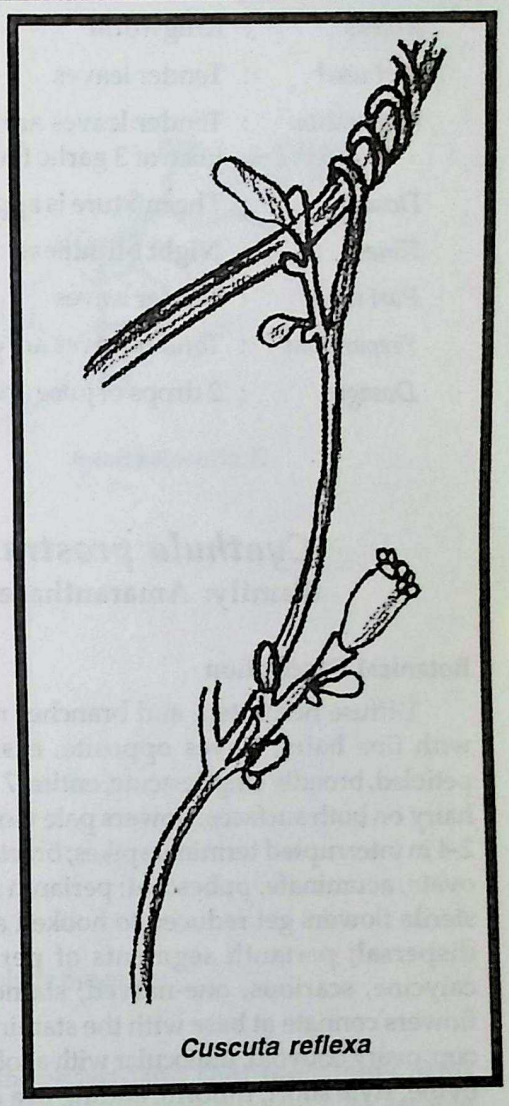
Habitat

Common throughout India; abundant in Bengal plains. It has no root under the ground, but only grows as a parasitic twiner on other plants, and, hence called *akaswel* (sky-twiner) or amarwel (immortal twiner), because it grows during the rains and every year the growth is afresh on the same plant.



Cuscuta reflexa

Parts Used

Plant seeds, stem and fruits.

Constituents

Quercetin, resins and an alkaloidal principle called 'Cuscutine' slightly bitter and soluble in ether and chloroform.

Dulcitol, luteolin, quercetin and a glycoside of luteolin, m.p. 318°, isolated from stem. Antiviral substance containing protein, M.W. 14,000-18,000 isolated.

Action

Plant is regarded as alterative, purgative and anthelmintic. Seeds are carminative and anodyne. Stem is purgative.

Preparation

Cold infusion, decoction, powder and poultice.

Uses

Cold infusion of the seeds is given as a depurative and carminative in pains and stomach-aches. As *poultice* they are also applied locally. *Seeds* are used along with sarsaparilla to purify blood. *Stems in decoction* are useful in constipation, flatulence, liver complaints and bilious affections. *Varalians* of the dodder are highly useful in piles. *Externally* they are used against itch and other skin diseases. The *fruits* are used in fever and cough.

Cyamopsis tetragonoloba, Taub.

(Family: Papilionaceae)

Vernacular Names

Tam.–Kothavarai; *Tel.*–Gorchikkudu; *Eng.*–Cluster Bean; *Mar.*–Gowaar; *Hind.*–Guar.

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Illness	:	**Ringworm**
Part used	:	Tender leaves
Preparation	:	Tender leaves are crushed to obtain 4 teaspoonful of juice. To this is added the juice of 3 garlic flakes.
Dosage	:	The mixture is applied at bed-time.
Illness	:	**Night blindness**
Part used	:	Tender leaves
Preparation	:	Tender leaves are crushed fine to obtain the juice; prepared fresh every day.
Dosage	:	2 drops of juice are put in each eye at bed-time for 7 days.

Cyathula prostrata
(Family: Amaranthaceae)

Botanical Description

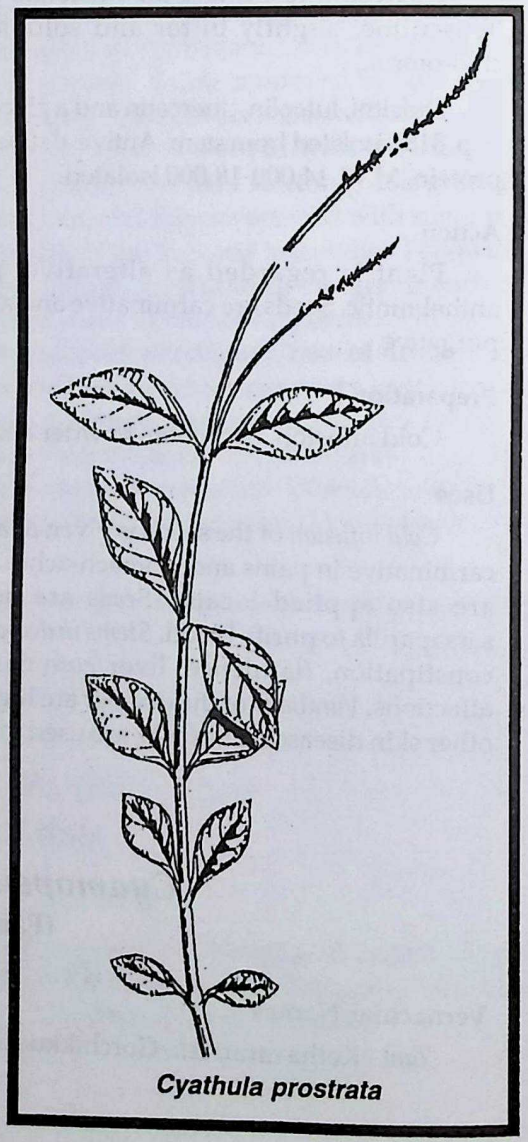
Diffuse herb; stem and branches reddish, clothed with fine hairs; leaves opposite, exstipulate, short-petioled, broadly elliptic-acute, entire, 7 × 4 cms, slightly hairy on both surfaces; flowers pale violet in clusters of 2-4 in interrupted terminal spikes; bracts and bracteoles ovate, acuminate, pubescent; perianth segments of the sterile flowers get reduced to hooked awns helping in dispersal; perianth segments of perfect flowers 5, calycine, scarious, one-nerved; stamens 5, staminal flowers connate at base with the staminodes forming a cup; ovary obovoid, unilocular with a solitary pendulous ovule, style short, filiform, ending in a capitate stigma; fruit an ovoid, thiny membraneous indehiscent utricle enclosed in the perianth; seeds oblong, yellowish brown.

Habitat

The plant grows in moist shady localities of all the plain districts in India.

Constituents

Structure of a new insect-moulting compound–cyasterone, mp. 164°–from roots along with capitasterone, C29-ecdysterols and amarasterones A, mp. 210°, and B, mp. 284°.



Cyathula prostrata

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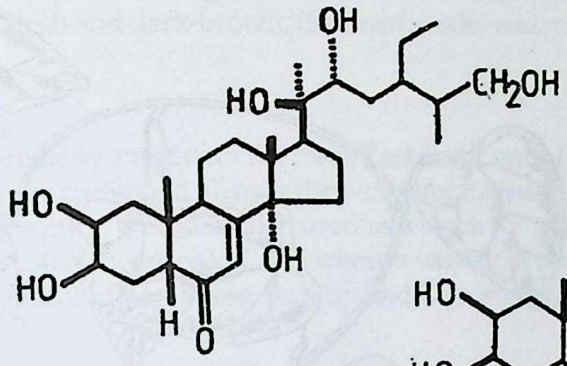
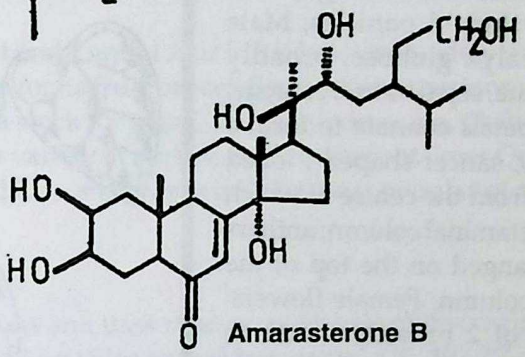
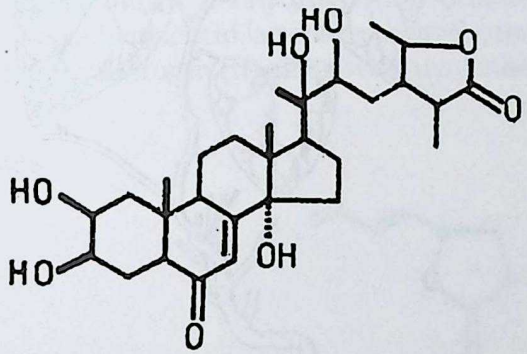
New Compounds



Amarasterone A



Amarasterone B



Cyasterone

Biological Activity

Cyasterone showed moulting hormone activity in *Calliphora* bioassay.

Uses

As the name *Apamargah* indicates, it hinders the path of the pedestrians. The drug is bitter, acrid, cardiotonic, astringent, carminative, diuretic, alleviative of *kapha* and *vata* and is useful as an errhine. It cures hiccough, ascites, enlargement of cervical glands, skin diseases, piles, pruritus, anorexia and urinary diseases. It overcomes the troubles due to worms and pathogenic organisms, arrests bleeding and dysentery. The whole plant is used in medicine. The important formulations using the drug are *Surasadi tailam, Aviltoladi bhasmam, Suvarnamuktadi gulika, Jatyadi tailam, Ardhavilvam kasayam*, etc.

Cyclea peltata

(Family: Menispermaceae)

Botanical Description

Slender hispid climber with long tuberous roots; leaves simple, alternate, exstipulate, peltate, long-deltoid, coriaceous, entire, palmately veined, slightly cordate at base, acute or mucronate at apex,

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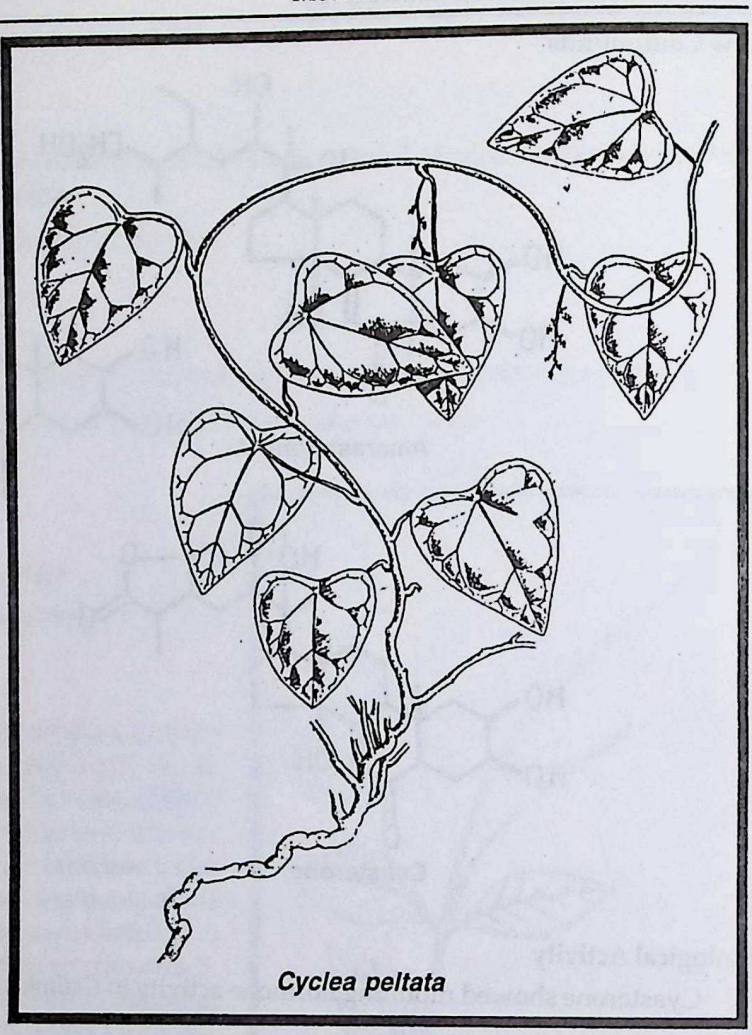
to 12.5 × 7.5 cms. dark green above covered with short stiff hairs, softly pubescent and pale beneath; flowers small, unisexual, greenish in axillary hispid panicles; Male flowers: calyx globose, broadly campanulate, sepals 4 to 6, connate, unequal; petals connate to form a semifleshy, saucer-shaped , lobed structure from the centre of which arises the staminal column; anthers 4 to 6 arranged on the top of the staminal column. Female flowers: perianth of 2 broadly ovate to orbicular, semifleshy structures; ovary single, style short ending in 3 stigmatic branches; drupe ovoid.



Cyclea peltata

Uses

Due to the blood purifying property of the drug, it is considered to be beneficial in treating skin diseases and poisonous affections. Root is the officinal part. It is bitter, acrid, cardiotonic and is useful in colic pains, fevers, vomiting, diarrhoea, heart-diseases, burning sensation, pruritus, worms, respiratory disorders, *gulma* (internal tumour) and ulcers. In Kerala it is largely used as an internal remedy in inflamed piles. *Ayaskrti, Candanasavam, Pathadicurnam, Patolakaturohinyadi kasayam,* etc. are some of the preparations using the drug.

Cydonia oblonga

(Family: Rosaceae)

Vernacular Name

Eng.–Quince.

Botanical Description

A deciduous shrub or small tree with grey, felted shoots. The leaves are alternate, entire, ovate to oblong, glabrous above, white-woolly beneath. The rather large, whitish flowers are short-stalked and

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solitary and have a pleasant fragrance. The fruit is a large, globose or pear-shaped, felted, aromatic pome with firm flesh and dark-brown, flattened seeds, which are *poisonous*. It is green at first, yellow when ripe.

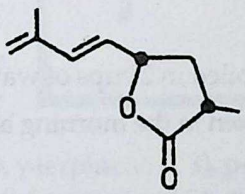
Habitat

Quince is probably a native of the Near East and Central Asia but it has been widely introduced elsewhere. It is now cultivated all over the world for its fruit, especially in warmer regions where the fruit is often more juicy. Quince is also used as a stock for pears. The common name, *Quince*, means *'apple of Cydonia'*, after the place in Crete where a variety of the tree grew. In ancient times Quince was regarded as a symbol of happiness, fertility and love and was one of the most popular of medicinal plants.

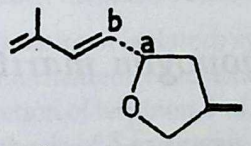
Constituents

Marmelolactones A and B isolated from fruits and their structures and absolute configurations assigned as (2R, 4S)-2,7-dimethyl-4-hydroxy-5(E)-7-octadienoic acid lactone and (2R, 4R)-2,7-dimethyl-4-hydroxy-5(E), 7-octadienoic acid lactone respectively; trans-(I) and cis-3-methyl-5-[(E)-3-methyl-1,3-butadien-1-yl] tetrahydrofuran (II) along with sixty other compounds identified in essential oil of fruit.

New Compounds



Marmelo lactone A (2R, 4S)
Marmelo lactone B (2R, 4R)



I
ab = Cis
II
ab = Trans

Uses

The fruits and the seeds are used medicinally. The fruit pulp contains sugars, pectins, essential oils, tannins and organic acids, including vitamin C. In herbalism all infusion or the dried fruit is used to treat digestive disorders, sore throat, diarrhoea and haemorrhage of the bowel. The seeds contain up to 22 per cent mucilage, a fatty oil, a glycoside (amygdalin) and tannins. They have emollient, expectorant, anti-inflammatory and astringent properties and are used dried, *uncrushed*, in an infusion

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or decoction to treat cough, gastritis and enteritis. Externally mucilaginous compresses made from soaked crushed seeds can be applied to wounds, ulcers, inflamed joints, chapped skin and eye inflammations. The mucilage from the seeds also makes a gargle for sore throats.

The fresh pulp of Quince fruits makes excellent preserves, jellies and syrups. The fruit is only edible when cooked; the *seeds must not be eaten.*

Cymbopogon citratus, Stapf.

Vernacular Names

Eng.–West Indian lemon grass; *Mah.*–Gavti chahao; *Hind.*–Gandhatrina

Illness : **(Cold) Rhinitis**

Part used : Leaves

Preparation : 1 fistful of leaves is used to prepare two cups of decoction. A little sugar is added.

Dosage : 1 cup of decoction is taken in the morning and evening till cured.

Illness : **Abdominal pain**

Part used : Leaves

Preparation : 1 fistful of leaves is boiled in 2 cups of water, cooled and taken.

Dosage : ½ cup of this tea is taken in the morning and evening till cured.

Illness : **Intestinal worms**

Part used : Leaves

Cymbopogon maritinii

Vernacular Names

Eng.–Rosha grass; *Mah.*–Rosha gavat; *Hind.*–Gandh bel; *Guj.*–Rauns; *Tam.*–Kavatham pollu.

Constituents

Revised structures of cymbopogone and cymbopogonol detection of α- and β-citrals, (72.29), myrcene (1.5), methylheptenone (0.2), linalool (1.2), linalyl acetate (0.1), 2-undecanone (0.3), geranyl acetate (0.1), citronellol (1.5) and nerol (0.8%) in essential oil by GLC; luteolin and its 6-C-glucoside isolated from aerial parts; detection of neral (29.0), geranial (47.0), elemol (19.0) and an unidentified sesquiterpene alcohol (19.0) is Saudi essential oil (0.16%); detection or geraniol (40.0), neral + geranial (13.0), α-oxobisabolene (12.0), menthone (0.2) and menthol (0.5%) in Ethiopian essential oil; detection of myrcene, limonene, methylheptenone, citral, nerol, geraniol, terpineol, citronellol, linalool and methylheptenol in essential oil (1.71%).

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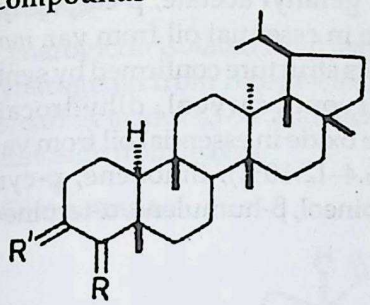
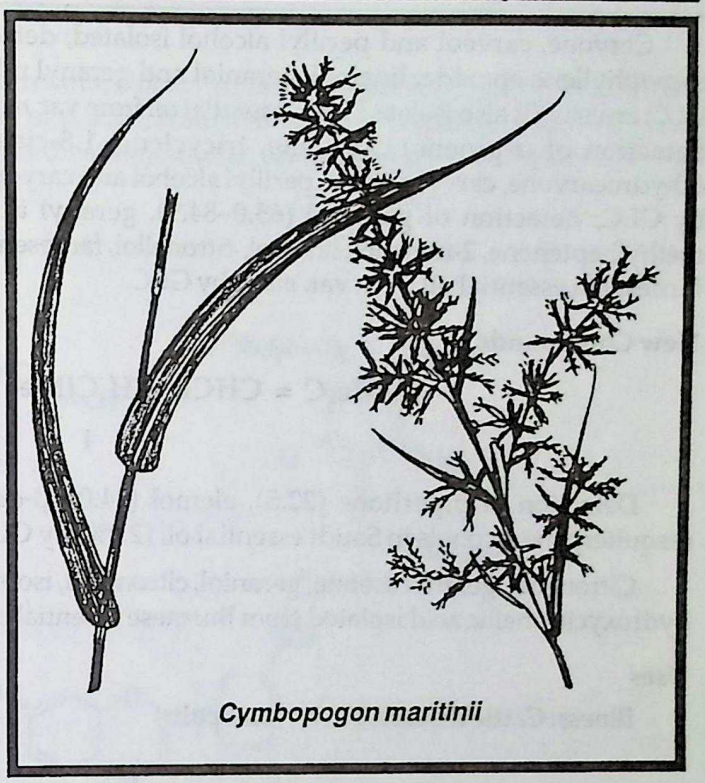
New Compounds



Cymbopogone
R = β-Me,H,R' = O
Cymbopogonol
R = CH_2, R' = β-OH,H


Cymbopogon maritinii

Geraniol (33.55), nerol (22.21), geranyl acetate (8.9), neryl acetate (3.78), farnesol (3.75) and an unidentified sesquiterpene arcohol (4.82%) as major constituents of essential oil.

Detection of α-pinene (3.5), camphene (0.9), β-pinene (2.4), sabinene (0.7), α-phellandrene (2.3), myrcene (0.8), α-terpinene (1.5), limonene (5.8), β-phellandrene (3.1), γ-terpinene (1.3), p-cymene (5.1), terpinolene (1.0), trans-α-bergamotene (0.7), caryophyllene (4.7), β-farnesene (2.0), α-humulene (3.5), γ-amorphene (0.7), β-bisabolene (5.4), α-murolene (2.3), β-selinene (2.9), δ-cadinene (2.4), γ-cadinene (3.6), octanal (0.7), bornyl acetate (4.8), neryl propionate (2.4), farnesol (5.1) and α-bisabolol (3.0%) in essential oil of plant collected from Nainital, Uttar Pradesh; geranyl acetate, borneol and its acetate isolated.

Citral, geraniol, anisaldehyde and α-terpineol isolated; synthesis of β-bisabolene; comparative MS and NMR study of intermedeol and isointermedeol led to conclusion that the reported isointermedeol was impure sample of (+) intermedeol; detection of terpinen-4-ol, β-terpineol, α-terpinyl acetate, borneol and nerolidol in essential oil by GLC; synthesis of δ-cadinene; comparison of essential oils from this plant as well as *C. citratus* and *C. pendulus* showed that citral was present in higher quantity in *C. pendulus*.

Detection of α-, β-pinenes, myrcene, linalool, car-3-ene, dipentene, phellandrene, 1,8- cineole, p-cymene, citronellal, piperitol, 4-terpineol, caryophyllene, α-terpineol, geranyl acetate, geraniol, β-bisabolene, β-farnesene, cadinene, elemol, β-caryophyllene oxide and eudesmol in essential oil by GLC; oil content in natural population of Indian plant varied from 0.15 to 1.72%.

Essential oil showed antifungal activity.

Detection of α-pinene (7.3), β-pinene (14.4), myrcene (17.9), terpinene (0.3), limonene (0.9), linalool (1.0), linalyl acetate (1.2), isopulegol (17.2), pulegone (10.9), piperitone (6.6) and piperitenone (1.9%) in essential oil by GLC.

Detection of citral (37.0–66.0%) in essential oils (0.36–1.00%) from plants grown in Arunachal Pradesh by GLC.

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Carvone, carveol and perillyl alcohol isolated; detection of geranyl acetate, p-caryophyllene, caryophyllene epoxide, linalool, geraniol and geranyl n-butyrate in essential oil from var. *motia* by GLC; an ester (I) also isolated from essential oil from var. *motia* and its structure confirmed by synthesis; detection of α-pinene, car-3-ene, tricyclene, 1,8-cineole, carvone, carveol, dihydrocarveol, dihydrocarvone, carvyl acetate, perillyl alcohol and caryophyllene oxide in essential oil from var. *sofia* by GLC; detection of geraniol (65.0–84.9), geranyl acetate (6.4–12.10%), limonene, p-cymene, methylheptenone, 2-nonanol, linalool, citronellol, farnesene, β-terpineol, β-humulene, α-terpineol and farnesol in essential oil from var. *motia* by GLC.

New Compounds

$$(E)Me_2C = CHCH_2CH_2C(Me) = CHCH_2OCOPr$$

I

Detection of piperitone (22.5), elemol (34.0), β-eudesmol (24.0), β-elemene (2.9) and two sesquiterpene alcohols in Saudi essential oil (2.9%) by GLC.

Citronellal, geranyl acetate, geraniol, citronellol, isopulegol, eugenol, elemol, citronellic acid and hydroxycitronellic acid isolated from Burmese essential oil.

Uses

Illness: Cattle disease, Fever, Joint pains

Cynara cardunculus
(Family: Compositae)

Vernacular Name

Eng.–Cordoon.

Botanical Description

A perennial herb with a stout, erect, branched stem and numerous spiny lanceolate leaves, which are smooth above and white-felted below. The terminal globose flowerheads with a fleshy receptacle have blue-violet ligulate florets, but no ray-florets. The flowerhead in bud is almost completely enclosed by conspicuous, spiny, green, leathery involucral bracts. The fruit, an achene, has a pappus of branched, feathery hairs.

Habitat

Cardoon is a native of Mediterranean Europe and was known to the ancient Egyptians, Greeks and Romans. It is still grown as a vegetable in some countries but in the British Isles it is used mainly for floral decorations. It may well be the ancestor of the familiar Globe Artichoke (*C. scolymus*), which is more widely cultivated for the inner tips of the fleshy involucral bracts and thickened receptacle of the flowerheads. The generic name, *Cynara*, comes from the Greek word *kynara* and means a kind of artichoke. The common name, Cardoon, is derived through the French *cardon* from the Latin word *carduus* for a thistle.

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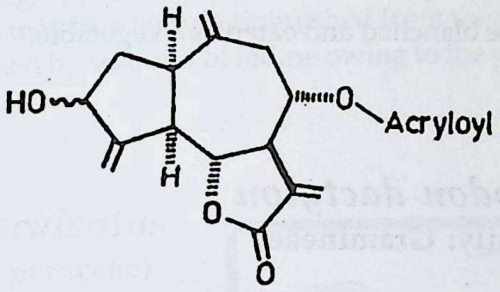
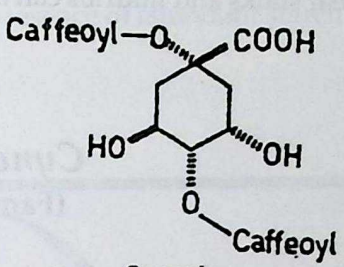
Constituents

Cynaropicrin isolated from leaves and structure elucidated; taraxasterol, β-sitosterol, stigmasterol and cynarogenin from receptacles; cynarin, m.p. 235°, from leaves; cynarotrioside, m.p. 274°, from leaves; caffeic acid, 1-,3-,4- and 5-caffeoyl, 1,4-dicaffeoyl-quinic acids, luteolin-7-β-D-glucoside- and 7-β-rutinoside from leaves.

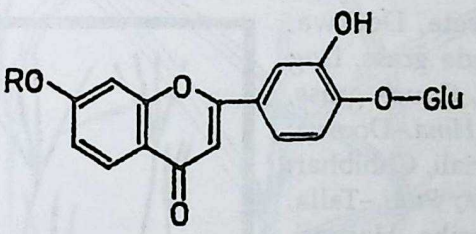
New Compounds



Cynaropicrin



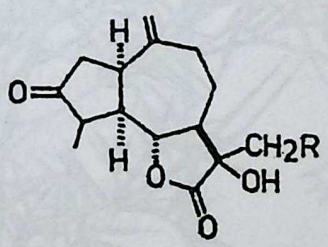
Cynarin



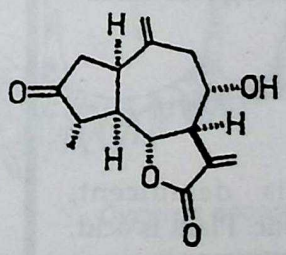
Cynarotrioside
R = Glu(6→1)Rha

Cyanidol-3-sophoroside, -glucoside, -caffeylsophoroside, -caffeylglucoside and –dicaffeylsophoroside isolated from leaves; cyanidol-5,3-diglucoside and cyanidol-5-glucosido-3-caffeylsophoroside from flowers; guaianolide lactones (I, II) and 8-epigrosheimine isolated from leaves and their structures determined; isolation of cynarin.

New Compounds



I
R = Cl
II
R = OH



8-epigrosheimine

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Uses

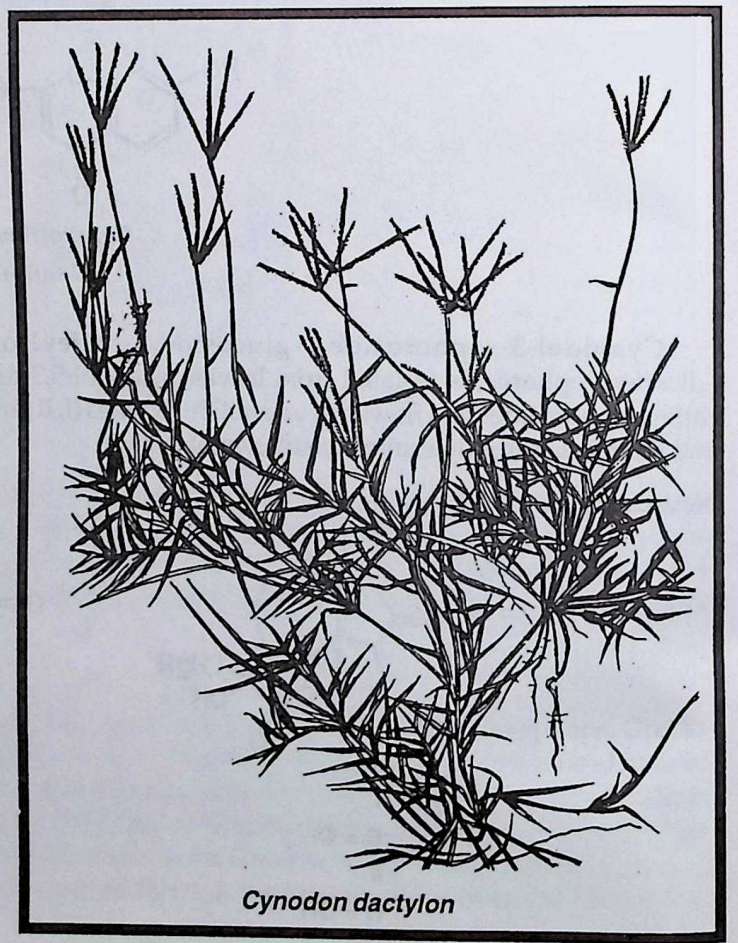
The leaves are used medicinally. The constituents include a bitter compound (cynarine), mucilage, tannins, organic acids and vitamin A. These substances give Cardoon strong choleretic and diuretic properties and it is used with success in the treatment of gall bladder and liver disorders, including hepatitis. Cardoon is also hypoglycaemic and antisclerotic. On the continent extracts of Cardoon are included in proprietary digestive tonics, in aperitifs and in liqueurs. The fresh juice from the leaves can be used externally to treat some skin disorders.

The inner leaf stalks and midribs can be blanched and eaten as a vegetable.

Cynodon dactylon
(Family: Gramineae)

Vernacular Names

Sans.–Granthi, Sveta, Doorwa, Bhargavi; *Eng.*–Bermuda grass, Dog grass, Huriallee grass, Couch grass, Creeping panic grass; *Hind.*–Doorva; *Ben.*–Durba; *Sind.*–Hariali, Chhibhar; *Mah.*–Haryali, Doorva; *Punj.*–Talla, Kabbar, Dub; *Tel.*–Garike, Haryali, Gerike; *Tam.*–Arugu, Aruvam-pillu, Mooyar-pul; *Mal.*–Karuka-pullu; *Can.*–Garikae, Ambate-hullu; *Kon.*–Jirbankura; *Fr.*–Chiendent; *Ger.*–Wucherndu Hundzahn.



Cynodon dactylon

Habitat

This elegant perennial grass grows everywhere throughout India.

Parts Used

Herb and root-stalk.

Action

Fresh juice is demulcent, astringent and diuretic. Plant is acid, haemostatic and laxative.

Uses

Fresh expressed juice of the grass is useful in haematuresis in vomiting and as an application in catarrhal

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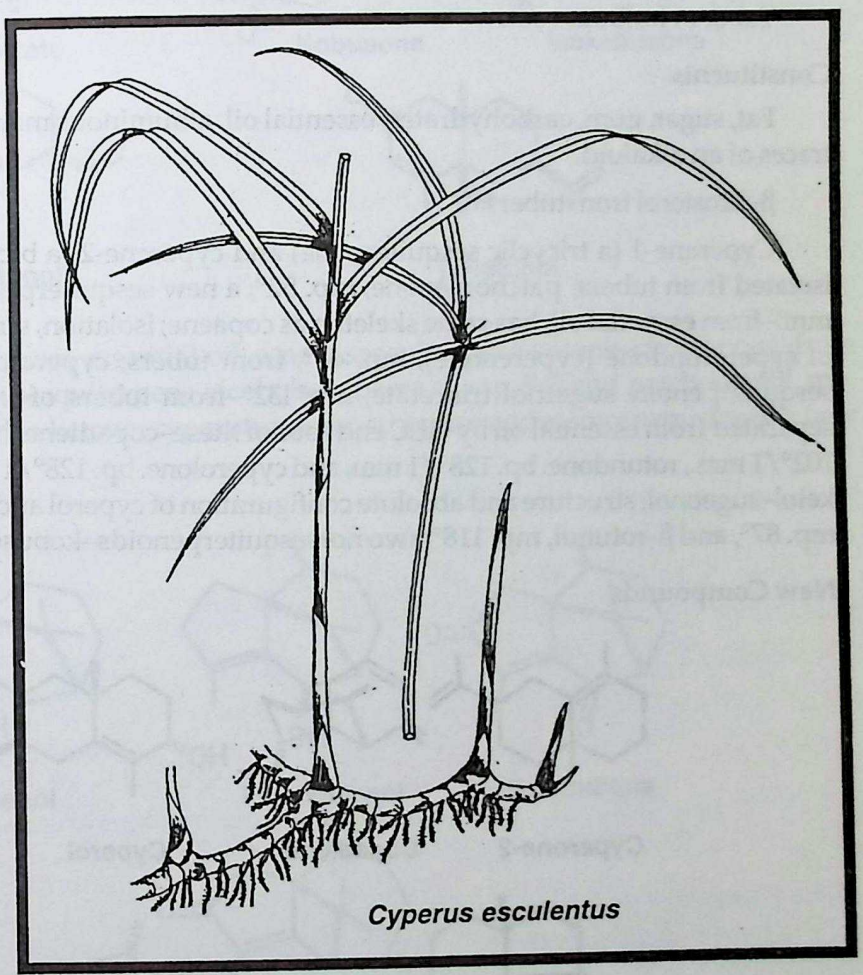
ophthalmia also to cuts and wounds as it checks bleeding for this purpose bruised grass may also be applied; *juice* when sniffed up in case of epistaxis proves a valuable styptic and stops bleeding. Fresh juice is used also in cases of dropsy, anasarca, chronic diarrhoea and dysentery. *Decoction of the roots* is valuable in cases of vesical calculus and in secondary syphilis. *Cold infusion of the grass* stops bleeding from piles; it is generally given with milk; useful in dysuria and irritation of the urinary organs. Root crushed and mixed with curds are given in cases of chronic gleet dose is two drachms of the roots. The plant is used in scorpion-sting. The rhizome of this grass, which is said to resemble cough grass (i.e. Agropyrum repens) in medicinal properties is being substituted in the market to true cough grass, and may be easily distinguished from the *genuine drug* (cough grass) by the fact that its section is blackened by solution of iodine owing to the presence of abundant starch.

Cyperus esculentus
(Family: Cyperaceae)


Cyperus esculentus

Botanical Description

Perennial herbs; stem at base erect; stolons slender, with small pale scales, often disappearing after the tubers are formed; tubers woody, zoned; leaves and bracts long; spikelets yellow or yellow-brown; glumes plicate-striate, slightly rigid in fruit.

Uses

Musta is an important home remedy for indigestion, sprue, diarrhoea and other intestinal problems of children. Root tuber is the part used in medicine. It is light, bitter, aromatic, astringent, carminative, diuretic, anthelmintic, galactagogue, emmenagogue and nervine tonic. It cures *kapha* and *pitta* disorders, dyspepsia, vomiting, indigestion, thirst, worm troubles, cough, bronchitis, dysuria, fever and poisonous affections. The drug is also used in epilepsy, loss of memory, blood diseases and general debility. The paste is applied in skin diseases and eye disease. *Mustaristam, Ceriya Rasnadi kasayam, Carngeryadi ghrtam, Vyaghryadi leham*, etc. are some the preparation using the drug.

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Cyperus rotundus, Linn.

(Family: Cyperaceae)

Vernacular Names

Sans.–Musta, Mustaka, Bhadramusta, Kurubilva; *Eng.*–Nut-grass; *Hind.*–Korchi-jhar. *Ben.*–Moothoo, Mutha, Nagarmothee, Sada-kufee; *Bom.*–Musta; Guj. & *Mah.*–Bank motha, Bimbal; *Tel.*–Tungamusti, Gandala, Tunga-musthalu; *Tam.*–Koraị-kizanghu, Tunga-gaddai; *Mal.*–Karimuttan, Kora-kizanna; *Can.*–Tangahullu, Koranari-gadde, Abdahullu; *Kon.*–Bhadramusti; *Sinh.*–Kalanduru.

Habitat

It is a plentiful species occurring throughout the plains of India, especially South India.

Parts Used

Tuber or bulbous root.

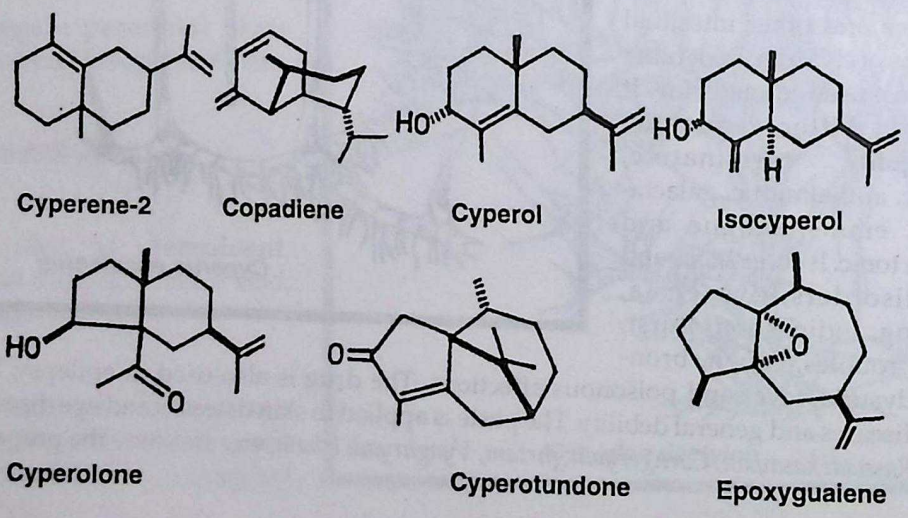
Constituents

Fat, sugar, gum, carbohydrates, essential oil, albuminous matter, starch, fibre and ash. There are traces of an alkaloid.

β-Sitosterol from tubers.

Cyperene-1 (a tricyclic sesquiterpene) and cyperene-2 (a bicyclic sesquiterpene hydrocarbon) isolated from tubers; patchoulenone, mp. 52°; a new sesquiterpene ketone–mustakone, bp. 128°/1 mm.–from essential oil, has same skeleton as copaene; isolation, structure and absolute configuration of cyperotundone (cyperenone), mp. 46°, from tubers; cyperolone, mp. 41°, from tubers; a new sesquiterpenoid–sugetriol triacetate, mp. 132°–from tubers of Japanese nutgrass; 27 compounds separated from essential oil by GLC and four of these–copadiene. bp. 130°/1 mm., epoxyguaiene. bp. 102°/1 mm., rotundone. bp. 128°/1 mm. and cyperolone. bp. 128°/1 mm.–characterised; sesquiterpenic ketol–sugeonol; structure and absolute configuration of cyperol and isocyperol; structure of α-rotunol. mp. 87°, and β-rotunol, mp. 118°; two norsesquiterpenoids–kobusone and isokobusone.

New Compounds



Cyperene-2 Copadiene Cyperol Isocyperol

Cyperolone Cyperotundone Epoxyguaiene

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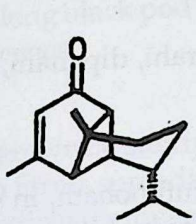
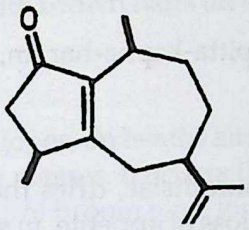
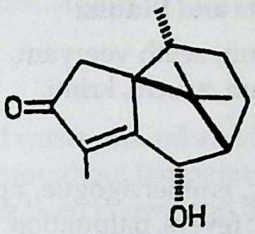


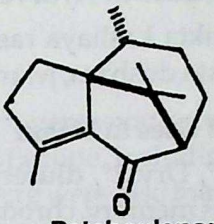
Mustakone



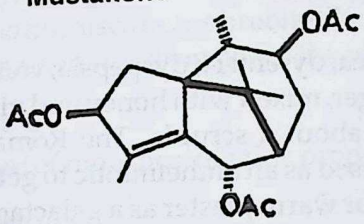
Rotundone



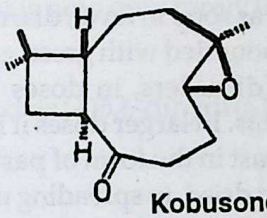
Sugeonol



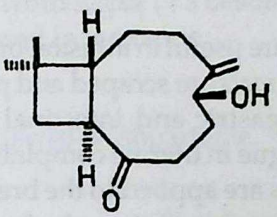
Patchoulenone



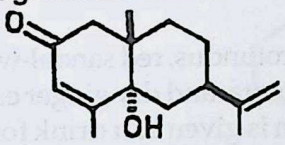
Sugetrioltriacetate



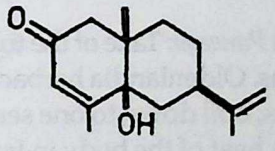
Kobusone



Isokobusone



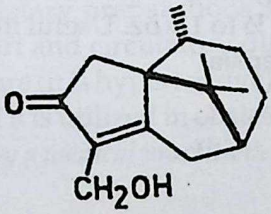
α-Rotunol



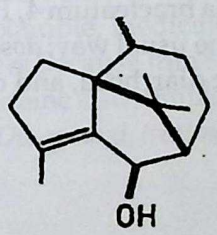
β-Rotunol

Isopatchoulenone, mp. 48°, from essential oil; a new sesquiterpene ketone–cyperenone–from essential oil; two new crystalline sesquiterpene alcohols–cyperenol, mp. 94° and patchoulenol, mp. 74°–from essential oil; isolation of a ketone–cyperotundone; structure and stereochemistry of a new sesquiterpene–scariodlone.

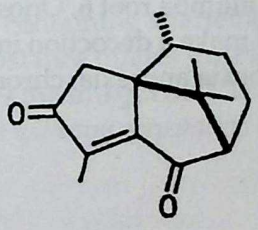
New Compounds



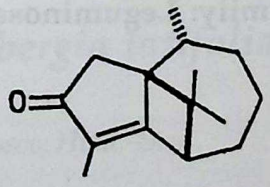
Cyperenol



Patchoulenol



Scariodione



Isopatchoulenone

Action

Stimulant, tonic, demulcent, diuretic, anthelmintic, stomachic, carminative, diaphoretic, astringent, emmenagogue and vermifuge.

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Action and Uses in Ayurveda and Siddha

Katu tikta kashaya rasam, seeth veeryam, pitta-kapha-haram, grahi, dipanam, pachanam, in trishna, rakta dosham, jwaram, aruchi, krimi.

Action and Uses in Unani

Hot 2°, Dry 2°, diuretic, emmenagogue, aphrodisiac, dries the futhoobath, in stone bladder, strengthens memory, chronic fevers, palpitation, loss of appetite, in scorpion bite.

Uses

Tubers are useful in infusion or as soup in fever, diarrhoea, dysentery, dyspepsia, vomiting, cholera, etc. *Bulbous roots* are scraped and pounded with green ginger, mixed with honey and given in cases of dysentery, gastric and intestinal disorders, in doses of about a scruple. The Romans used it as emmenagogue in uterine complaints. In larger doses it is used as an anthelmintic to get rid of worms. Fresh tubers are applied to the breast in the form of paste or warm plaster as a galactagogue. Paste is applied to scorpion stings and when dried, to spreading ulcers. Following decoctions are recommended for use in fevers:

1. *Shadanga Paneeya*: Take of the tubers of Cyperus rotundus, red sandal-wood, root of Andropon maricatus. Oldenlandia herbaceae, Pavonia odorata, and dry ginger each one drachm, water two seers; boil down to one seer. This decoction is given as a drink for appearing thirst and relieving heat of the body in fever. It may be taken *ad lihitum*.
2. Take of Cyperus rotundus 5, Solanum jacquini 4, Gentian root 4, Cocculus cordifolius 4, Dried ginger 6, Oxalis corniculata 6, Red sandalwood 4 and Poopy capsules 6 parts. Mix and make a decoction. To the decoction when ready add honey and long-pepper powder. *Dose*: oz. ½ to oz. ½. Useful in recurrent or relapsing fever.
3. Take of Andropogon muricatus 4, Cyperus rotundus 5, Chlicory 3, flowers of Woodfordia floribunda 4, March mallow root 5, Common mallow 6, Carum nigrum 7, Dried ginger 6, Pimpinella anisum 6, Myrtus communis 4, Poppy Capsules 4, Cardamoms 6, Mint; Spearmint 4, Calumba root 6, Onosma bracteatum 4, Pomegranate flowers 4 and sugar 10 parts. Mix and make a decoction in the usual way; *dose*: oz. ½ to 1½ oz. Useful in long standing fever, cachexia anorexia, chronic diarrhoea, and dyspepsia.

Cytisus scoparius
(Family: Leguminosae/Fabaceae)

Vernacular Name

Eng.–Broom, Scoparium.

Botanical Description

A shrub with erect, green, angled, tough, spineless stems. The numerous small alternate leaves are lanceolate below and trifoliate in the upper parts of the stems. The large yellow flowers grow singly in the upper leaf axils. They produce large quantities of pollen and are attractive to bees. The

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fruit is an oblong black pod with brown hairs on the margins. It twists open when ripe. *All parts of the plant are poisonous.*

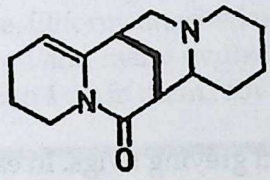
Habitat

Broom grown on sunny slopes, on heaths and waste ground and in open woods, usually on acid soils. It often forms spreading masses. It occurs throughout temperate Europe, including the British Isles. The medicinal properties of Broom have long been known and there were also many traditions associated with the use of the branches to make brooms (hence the common name). The specific epithet, *scoparius*, also means broom-like; it comes from the Latin word *scopae* (= a besom), Broom was once used as a cure for dropsy but the plant is now only rarely used in medicine.

Constituents

Structure of monspessulanine proposed as (+)5,6-dihydro-10-oxo-α-isoparteine.

New Compounds



Monspessulanine

Uses

All parts of the plant have a medicinal value, the flowers, flowering stems, seeds and roots, the flowering stems being used the most. The most important active constituent is the alkaloid sparteine. Other ingredients include, a glycoside (scoparin), tannins, essential oils and bitter compounds. The amounts of these substances vary a great deal and Broom is now regarded as too unreliable–and therefore potentially too toxic–for general use. Some of the constituents are, however, isolated and included in proprietary preparations. For example, medicines containing sparteine are sometimes prescribed for heart and circulatory disorders because thin substance dilates the blood vessels and raises blood pressure (it is hypertensive). Sparteine also stimulates the smooth muscles of the intestines and the uterus and it is utilized in obstetrics. *Dosage and, treatment with any preparation containing Broom must be prescribed by a medical practitioner.*

Dalbergia latifolia

Vernacular Names

Eng.–East Indian Rosewood; *Mar.–Sissoo*; *Hind.*–Sisu.

Illness	:	**Fever**
Part used	:	Leaves
Preparation	:	Leaf juice
Dosage	:	Half a cup of juice is taken in the morning and evening for 3 days.

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Illness : **Any illness in cattle**

Part used : Wood

Preparation : Four pieces of 3" × 3" wood and a pod of "Cassia fistula" are cut into small bits. Light cowdung cakes, place them on an earthen roof-tile and on these the bits of shisav wood and bahawa pods. The tile is placed below the head of the animal so that the fumes envelop the head of the animal.

Dosage : The fumigation is given twice a day for 5 or 6 days.

Daphne mezereun
(Family: Thymelaeaceae)

Vernacular Name

Eng.–Mezereon.

Botanical Description

A small deciduous shrub, with erect greying twigs. In early spring it bears racemes of fragrant pinkish-mauve flowers in the axils of fallen leaves of the previous year. The alternate, pale-green, lanceolate to oblong leaves appear after flowering is over. The fruit is a bright-red drupe. *All parts of the plant are poisonous*; the red berries can be fatal if eaten by a child.

Habitat

Mezereon is native to temperate Asia and to most parts of Europe, including the British Isles, but it is now rare and protected in many countries. Until recently it was protected in Britain, but although it is still very rare it is no longer considered to be in danger of extinction. It grows wild in woods and scrub in some parts of England. It is also frequently grown in gardens. The genus is named after Daphne, one of the nymphs of Greek myth who was saved from the attentions of Apollo by being changed into a laurel tree. The specific epithet, *mezereum*,–and the common name–are derived from the Arabic word *mazaryun* used by the Arabian physician Avicenna. In the old days Mezereon was used medicinally to alleviate headache and toothache and in more recent times as a purgative and as a treatment for rheumatic, venereal and scrofulous conditions. It is now rarely if ever used in conventional medicine but it still has a place in homeopathy. It is too toxic for internal use.

Constituents

Taraxerone isolated from leaves; daphnoretin and β-sitosterol from bark, stem and roots.

Sterol, mp. 131°, and three glycosides–G-1, mp. 196°, G-2, mp, 175°, and amorph. G-3–isolated from roots; G-1 and G-3 identified as flavonoid glucosides but not characterised; daphnin, mp. 225°, isolated from roots.

Uses

The bark is the medicinal part. Its constituents include the acrid poisonous alkaloid mezereine and the glycoside daphnine. These substances have an irritant, rubefacient effect and cause blistering, if used for a long period. Daphanine is also hallucinogenic. A tincture is used in homeopathy for

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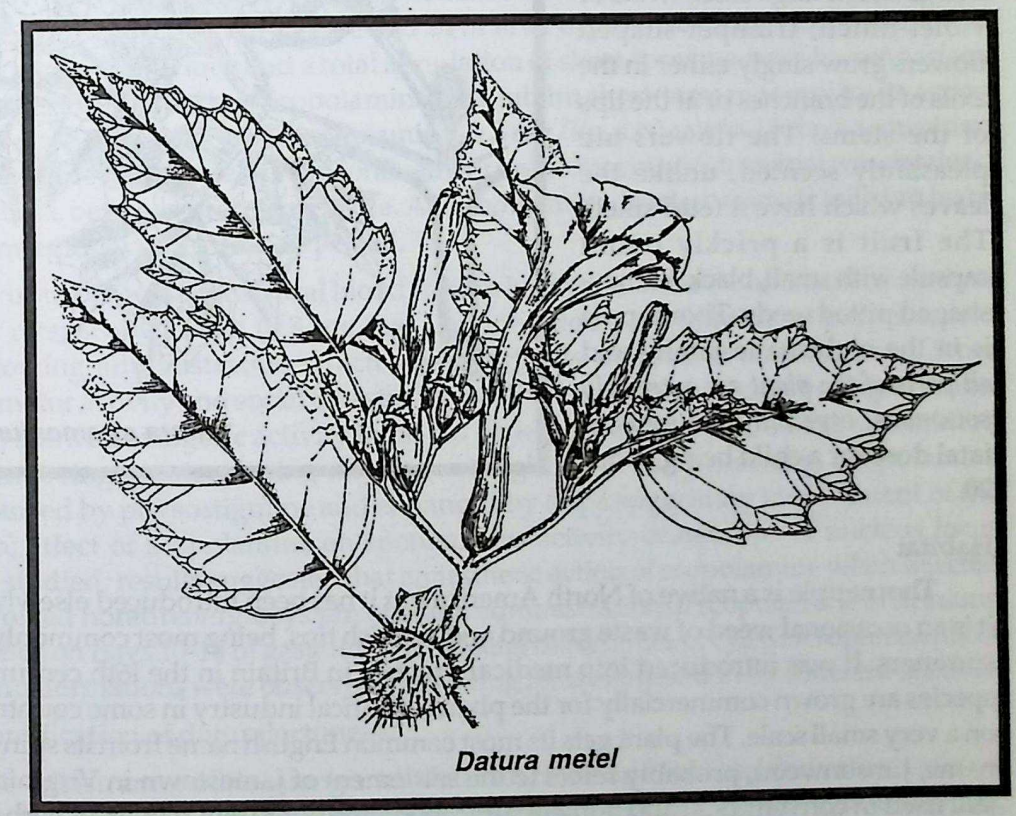
various skin disorders. All Mezereon preparations, including ointments and liniments, should be applied only under strict medical supervision. The herb should not be taken internally. *Mezereon is dangerous and it should never be collected and used for self-medication.*

Datura metel
(Family: Solanaceae)

Botanical Description

Erect subshrub; leaves simple, alternate, elliptic to angulate acute or acuminate, 10-18 × 7-15 cm, base unequally truncate, margin entire or sinuate or repand-dentate, often glabrous; flowers large, terminal, solitary; calyx gamosepalous, finely pubescent, long tubular, 5-toothed at apex; corolla gamopetalous, regular, long tubular, funnel-shaped with a spreading 5-angled plaited limb, white or purplish blue; stamens 5, filaments free, filiform, attached near the base of the corolla, ovary superior, clothed with soft prickles, 4-chambered and many ovuled, style filiform, stigma two-lobed; fruit a subglobose, greenish, fleshy capsule, 3 to 4 cm in diam., covered with short, blunt spines; seeds many, compressed.



Datura metel

Habitat

The plant is found in almost all districts of the hotter parts of India, as a weed in waste places, by roadsides and in garden land. It is also reported from tropical and subtropical Asia and Africa, now widely cultivated throughout the warmer regions of both hemispheres.

Uses

In traditional medicine, this is a reputed drug in the treatment of rabid dog-bites and poisonous insect bites. It is reported to be bitter, acrid, astringent, germicidal, anodyne, antiseptic, antipholgistic, narcotic and sedative. The drug gives good complexion, improves digestion and cures skin diseases such as itching, scabies, ulcers and leprosy, dandruff, fever, dysuria, piles, anaemia and inflammatory swellings. It is also useful in respiratory ailments, ear ache, eye diseases,

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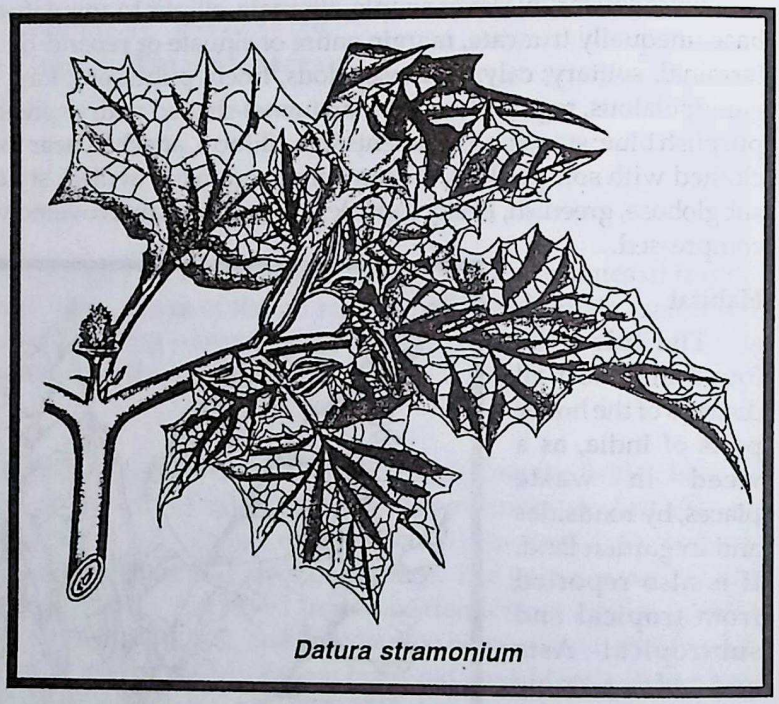
insanity, rheumatism and elephantiasis. Root, leaf and flower are used in medicine. The important formulations using the drug are *Kanakasavam, Dhurdhuradi tailam, Dhurdhurapatradi* coconut oil, *Mrtasanjivini*, etc.

Datura stramonium
(Family: Solanaceae)

Vernacular Names

Eng.–Thornapple, Jims.



Datura stramonium

Botanical Description

An annual herb with a robust, branched, leafy stem. The alternate leaves are pointed oval with incurving, coarsely toothed margins. The large erect, white or violet-tinted, trumpet-shaped flowers grow singly either in the axils of the branches or at the tips of the stems. The flowers are pleasantly scented, unlike the leaves which have a fetid smell. The fruit is a prickly ovoid capsule with small, black, kidney-shaped pitted seeds. Thornapple is in the nightshade family and *all parts of the plant are extremely poisonous, especially the seeds*, a fatal dose for a child being about 20.

Habitat

Thornapple is a native of North America but it has been introduced elsewhere. In the British Isles it is an occasional weed of waste ground and rubbish tips, being most commonly seen at the end of hot summers. It was introduced into medical practice in Britain in the l6th century. It and other *Datura* species are grown commercially for the pharmaceutical industry in some countries, but in Britain only on a very small scale. The plant gets its most common English name from its spiny fruits. An alternative name, Jimsonweed, probably refers to the settlement of Jamestown in Virginia, USA. Thornapple is still used in conventional and homeopathic medicine but rarely, if ever, in herbalism on account of its toxicity.

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Constituents

Burundi drug 'Rwiziringa' consisting of seeds of plant used by tribals for treatment of mental diseases.

Scopolamine isolated from fresh plant; seed glycerides contained linoleic acid (53.7) and oleic acid (27.1 %). Hyoscyamine, scopolamine and meteloidine isolated from leaves and seeds; leaves also contained quercetin-7-glucosido-3-sophoroside, quercetin-7-glucosido-3-glucogalactoside and their esters with caffeic and p-coumaric acids, kaempferol-7-glucosido-3-sophoroside and kaempferol-7-glucosido-3-glucogalactoside and their esters with caffeic acid. Small amounts of daturadiol and daturaolone also isolated from seeds. Roots contained 3α,6β-ditigloxytropane, 6β-propanoyloxy-3α-tigloyloxytropane and 3α,6β-tigloyloxytropane-7β-ol.

Scopolamine and hyoscyamine isolated.

Biological Activity

Pretreatment with atropine sulphate or scopolamine bromide (0.05-0.5 mg) by intracerebroventricular injection into conscious cats abolished aggressive response to low doses of carbachol and eserine sulphate. Further, most doses of both drugs blocked convulsions but not fighting behaviour caused by higher doses of carbachol and eserine sulphate. At highest dose scopolamine prevented both aggressive and convulsive responses to eserine sulphate but not carbachol; scopolamine (1 mg/kg) administered i.p. in mice 10 min before and 24 hr after exploratory behaviour tests, led to small decrease in exploratory behaviour and a total annulation of short-term memory in comparison with animals given only second injection. Scopolamine may inhibit short-term memory by its action on cholinergic system; male rats given daily scopolamine (0.3 mg/kg, s.c.) over a 15 days acquisition period were trained in 8-arm radial maze using a confinement procedure in which animal was detained in centre of maze for 10 sec between each arm choice. All scopolamine-treated animals failed to learn radial maze spatial strategies over the 15-day period.

Scopolamine disrupted regulation of local blood flow in brain and altered basal tone of cerebral pial artery system in rats; scopolamine (0.3 mg/kg, i.p.) inhibited play fighting in prepubescent male rats 20 min following administration which was effectively blocked at doses above 0.5 mg scopolamine/kg; locomotor activity and social investigation behaviour were increased by scopolamine. Scopolaine (i.p. or i.v.) showed analgesic activity in rat tail flick-test which appeared to be associated with circadian rhythm, being greater during day than at night or in early morning. Scopolamine analgesia was antagonised by physostigmine and enhanced by dopa suggesting involvement of the M-cholinergic system; effect of scopolamine on spontaneous activity of neurons of nucleus locus ceruleus of brain was studied; results suggested that anaesthetic action of scopolamine when injected intraventricularly involved noradrenergic system of brain; administration of scopolamine in drinking water to pregnant rabbits on days 10-14 of gestation led to foetal deformities of eye (microphthalmia or buphthalmia). These malformations were observed in all living fetuses present in six different animals.

Isolation and identification of daturalactone-4.

A new vitanolide–vitastramonolide–along with daturalactone and its keto derivative isolated from leaves and characterised as 5α,12α,27-trihydroxy-1-oxo-6α,7α-epoxy-22R-vita-2,24-dienolide; two new β-carboline derivatives–fluorodaturatine and homofluorodaturatine–isolated from seeds and their structures elucidated.

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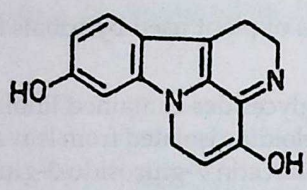
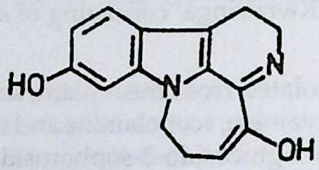
New Compounds



Fluorodaturatine



Homofluorodaturatine

Uses

The leaves and seeds are used medicinally. Their constituents include tropane alkaloids (0.4 per cent), principally hyoscyamine, atropine and scopolamine, and traces of an essential oil. These substances give Thornapple antipasmodic and hallucinogenic actions, they inhibit glandular secretions and dilate the airways. In medicine today Thornapple is mostly used in tinctures and proprietary preparations to treat asthma, bronchitis and Parkinson's disease. It is ocassionally prescribed in the form of cigarettes, *Thornapple is a dangerous plant; it should never be collected and used for self-medication.* It induces symptoms of poisoning similar to those caused by Deadly Night-shade.

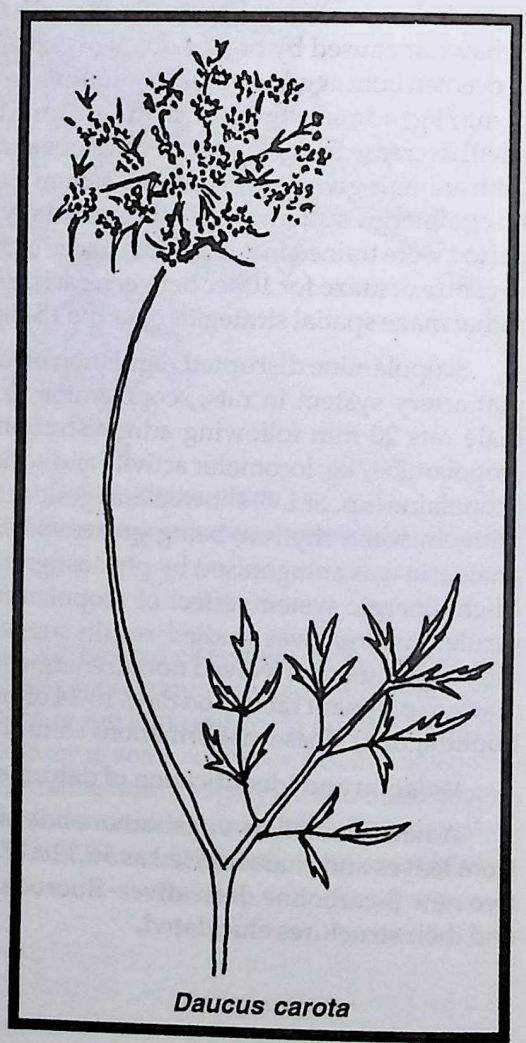
Daucus carota
(Family: Umbelliferae)

Vernacular Names

Sans.–Shikha-mulam, Shekhamulama, Garijara; *Eng.*–The Carrot; *Sind.*–Pitai Gajar, Petaigagar; *Hind., Mah., Guj. & Ben.*–Gajar; *Arab.*–Jazar; *Pers.*–Gazar, Zardak; *Tel.*–Pita-kande, Gajjara-gedda; *Tam.*–Gajjara-kilangu; *Can.*–Gajjari, Manjal mulangi; *Kash.*–Mormuj, Bulmuj; *Fr.*–Carotte cultive; *Ger.*–Gemeiner mohre, Karotti.

Botanical Description

A biennial herb with a spindle-shaped taproot, which is white in the wild sub-species (*sylvestris*) and generally orange-red or yellow in the cultivated form (*sativus*). In the second year the plant produces an angled, branched, hairy, furrowed stem bearing alternate, bi- or tri-pinnate, finely divided leaves. The flowers, which are arranged in dense terminal compound umbels, are white but a middle one is usually pinkish. The much-divided bracts under the flowerheads are distinctive. The fruit, a double achene, is flattened and ribbed with bristles and hooked spines on the ribs.



Daucus carota

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Habitat

Indigenous to Kashmir and Western Himalaya; now largely cultivated in India for culinary purposes.

Wild Carrot grows in fields and other grassy places, especially on chalky soils and near the sea, throughout most of the British Isles. The root is tough and inedible; that of the cultivated varieties is long, cylindrical and fleshy–the familiar kitchen carrot. The common name, Carrot, and the specific epithet, *carota*, are derived from the Greek word *karoton* for the wild plant. Carrots were known as a vegetable in ancient Greek and Roman times. The practice of cultivating them was introduced to Elizabethan England by Flemish refugees. Their use as a herbal remedy has a long history and they remain a popular treatment.

Parts Used

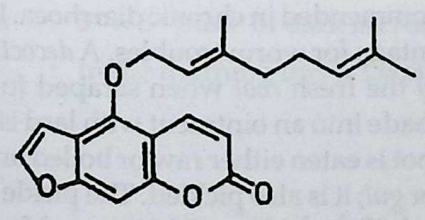
Root and fruit.

Constituents

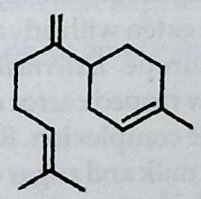
Aqueous extract of seeds showed spasmodic action on smooth muscles of isolated ileum and trachea and rectus abdominis muscle of frog. Use of drug as carminative may be due to its cholinergic action on smooth muscles of gastrointestinal system; aqueous suspension (2%) of essential oil produced transient fall of blood pressure in anaesthetised dog without influencing respiration, but higher doses produced persistent hypotension; it did not show any analgesic effect in rats but exerted marked CNS depressant action in rats and fish.

Volatile oil, an aldehyde, m.p. 112° and a compound m.p. 230°, isolated from fruits; a new sesquiterpene–(+)daucene, b.p. 96°/4mm–from essential oil; analysis of oil showed presence of α-pinene, nopinene, sabinene, dipentene, p-thymol, linalool, geraniol, bergamottin, β-bisabolene; a sesquiterpene alcohol, m.p. 119°, from essential oil of wild carrot; linalool, geraniol, geranyl acetate, α- and β-pinene, sabinene, limonene, bergamotene, bisabolene, daucene, carotol, daucol, p-thymol, α-curcumene, asarone and elemicin from essential oil of fruits of wild carrot growing in Northern Caucasus; farnesene and β-elemene also isolated; structure of daucol; choline and a quaternary base isolated from seeds; a diglycoside of cyanidin isolated from var. *sativa* DC.

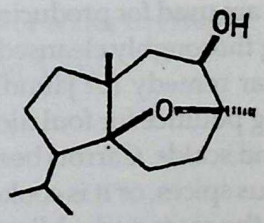
New Compounds



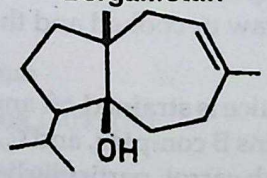
Bergamottin



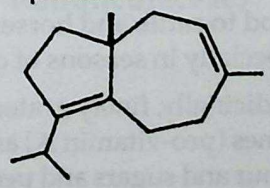
β-bisabolene



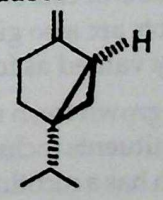
Daucol



Carotol



(+)Daucene



Sabinene

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The fresh vegetables (yellow and red carrots) contains:

	Yellow Carrots	*Red Carrots*
Moisture	81.40 p.c.	77.86 p.c.

Completely dried material contains:

Ether Extract	1.72 p.c.	1.12 p.c.
Albuminoids (containing Nitrogen 1.23)	7.63 p.c.	7.05 p.c. (%containing Nitrogen 12%)
Soluble carbohydrates	74.96 p.c.	73.60 p.c.
Woody fibre	6.56 p.c.	10.52 p.c.
Ash (containing Sand 0.48 p.c.)	9.08 p.c.	7.71 p.c. (containing sand 0.22)

Root contains carotin, hydrocarotin, sugar, starch, pectin, malic acid, lignin, albumen, extratives, salts and a volatile oil. Fruit contain volatile oil and a fixed oil; the two principal constituents are a terpene belonging to Wallach's pinene group and an oxygenated body standing in near relation to cineol. Carrots are exceptionally rich in iron, a small proportion of which exists dissolved in cell-sap and which is entirely precipitated by boiling. As-0.005 mg. in 100 g. root.

Action

Carrot has a beneficial influence on the kidneys and dropsy, and prevents the brick-dust sediment sometimes found in the urine. As antiseptic it prevents putrescent changes within the body. Seeds are used as aphrodisiac and nervine tonic. Carrots cleanse the blood. Seeds are aromatic, stimulant and carminative.

Preparation

Infusion (1 in 10), dose–½ to 1 ounce; Fl. Extract. Dose–5 to 30 minims; Powder.

Uses

Seeds are used for producing abortion. Fruits are recommended in chronic diarrhoea. Raw carrots, after being thoroughly cleansed, can be eaten with advantage for worm troubles. A *decoction* of carrot is a popular remedy for jaundice in Europe. *Externally* the fresh *root* when scraped forms a good stimulating poultice for foul ulcers. Raw rasped carrot made into an ointment with lard is much used in burns and scalds. Carrots beautify the complexion. Root is eaten either raw or boiled and seasoned with various spices, or it is cooked with milk and sugar or *gul*; it is also pickled. The pickle is prepared by boiling the roots and adding salt, mustard-seed and chillies, and it will keep good for one or two months. The roots of coarser varieties are sometimes dried and ground into flour and eaten with milk or whey. Carrots arc also given as food to cattle and horses, either raw or cooked and the leaves and tops are highly valued as fodder, especially in seasons of drought.

The fully grown fresh root is medicinally, finely grated or the juice is strained off and used on its own. The constituents include carotenes (pro-vitamin A) and vitamins B complex, and C, the alkaloid daucine, which has a nicotine-like odour and sugars and pectins. Fresh carrot, particularly the carotene constituent, affects the keenness of sight and the ability to see in dim light. It has anthelmintic, diuretic

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and stomachic properties. For children it is effective for digestive ailments and tonsillitis. A carrot diet is said to alleviate pain in cancer patients. Carrot juice can, however, be toxic if taken in excessive amounts as it induces hypervitaminosis A. An infusion of the fruits is sometimes used in tea mixtures as an anthelmintic.

Delonix elata, Gamble

Vernacular Names

Eng.–White gold mohur; *Mah.*–Vayni.

Illness	:	**Bronchitis or pneumonia in infants**
Part used	:	Leaves
Preparation	:	2 handsful of leaves and a fistful of goat's dung are mixed and crushed.
Dosage	:	The mixture is tied to the abdomen every evening for 3 days.
Note	:	If there is no improvement within 24 hours take the infant to a doctor.
Illness	:	**Toothache**
Part used	:	Twigs
Use	:	Fresh twigs are brought daily, chewed and used to clean the teeth for 15 days.
Illness	:	**Jaundice**
Part used	:	Leaves
Preparation	:	2 handsful of leaves are crushed, put in 1 glass of water to soak for 20 minutes and then strained.
Dosage	:	Half a glass to be taken in the morning and evening for 7 days.
Illness	:	**Jaundice**
Part used	:	Bark
Preparation	:	3″ × 3″ piece of bark is crushed and kept in a glasss of water overnight.
Dosage	:	In the morning this is taken on an empty stomach for 3 days.

Delphinium consolida
(Family: Ranunculaceae)

Vernacular Name

Eng.–Forking Larkspur.

Botanical Description

An annual or biennial herb with a slender taproot and an erect, branched, leafy stem. The leaves are sessile, alternate and palmate with the segments finely divided. The blue flowers have a pronounced

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upward-curving spur which secretes nectar. They are arranged in a terminal spike. The fruit is a follicle with flattened, black, pitted seeds. *All parts of the plant, except the flowers are poisonous.* The seeds are especially toxic and the fruits should be removed before the flowerstems are used in floral decorations.

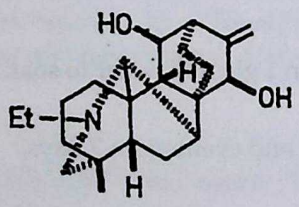
Habitat

Forking Larkspur is native to the Mediterranean region but it has spread to all parts of the world along with the cultivation of grain. In the British Isles it occurs as a rare casual of cornfields and waste places, especially near to ports. Some large-flowered variceties of larkspur are very decorative; they are also poisonous. The usual garden species is *D. ajacis* (= *Consolida ambigua*). In ancient times the plant was used to heal wounds and the specific epithet, *consolida*, and the preferred generic name, *Consolida*, may refer to this former medicinal use. More likely, however, these names allude to the fused, or consolidated, perianth segments. The name *Delphinium*, from the Greek word *delphinion* (= dolphin-like), was given to the larkspurs because their flowers were head to resemble a dolphin's head. Forking Larkspur, and its close relative Stavesacre (*D. staphisagria*), were once used for a variety of ailments. They are now rarely used except to destroy lice and nits in the hair.

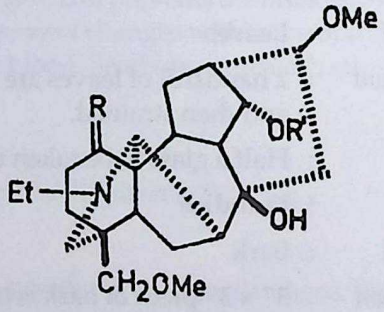
Constituents

Isolation and structure of two new diterpene alkaloids–denudatine m.p. 248° and denudatidine, m.p. 273°–from roots; in addition β-sitosterol and its glucoside, an unsaturated hydrocarbon and a monohydric alcohol isolated from roots; structure elucidation of condelphine, talatizidine and isotalatizidine; crystal structure of denudatine.

New Compounds



Denudatine



Condelphine
R = H,α-OH, R' = Ac
Isotalatizidine
R = H,α-OH, R' = H
Talatizidine
R = H,β-OH, R' = H

Uses

The flowering stems and seeds contain alkaloids, the glycoside delphinine, aconitic acid (not in the flowers) and constituents yet to be identified. These substances give Forking Larkspur diuretic, anthelminitic, insecticidal and purgative properties. It is dangerous to take any preparation from it internally. *Forking Larkspur should never be collected and used for self-medication.* The alkaloids act on the nervous system like those of Monkshood causing general weakness and eventually respiratory failure.

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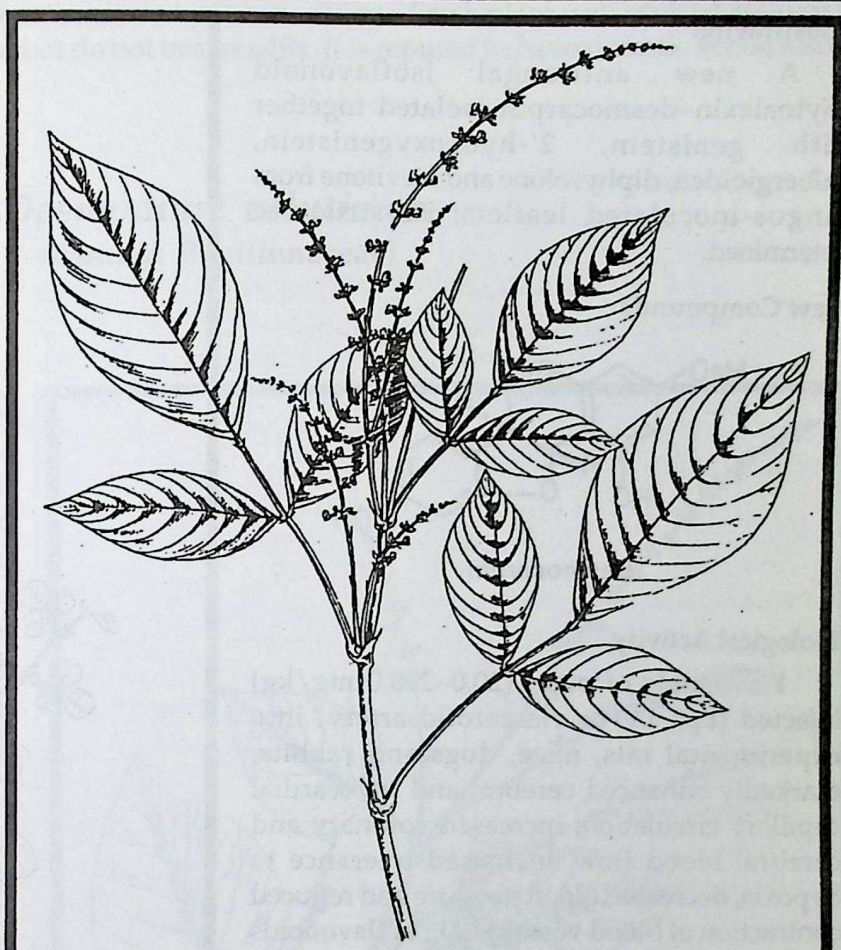
Desmodium laxiflorum
(Family: Papilionaceae)

Botanical Description

Sub-shrub, branchlets angular and puberulous; leaves alternate; 3-foliolate; leaflets ovate-elliptic acute, terminal leaflet much larger than the laterals, to 10 × 5 cm, puberulous above, adpressed-pubescent below; stipules narrowly triangular; flowers bluish in fascicles on a long slender raceme; calyx 4 lobed, upper lobes connate; corolla papilionaceous standard ovate or orbicular, wings auriculate at base, stamens (9)+1; stipitate, to 2 cm, margins indented.

Habitat

Western Ghats, Mysore, Coimbatore, Nilgiris and Travancore, upto 3,000 ft. Reported also from Malaysia and Formosa.



Desmodium laxiflorum

Desmodium trifiolium, Dc.
(Family: Papilionaceae)

Vernacular Names

Hind.–Motha, Kudaliya; *Ben.*–Koolaliya, Kodalia; *Bom.*–Jangli-methi; *Punj.*–Chamyar, Marara; *Tel.*–Moohoodoo, Moordoo; *Mah. & Kon.*–Ran-methi; *Pers.*–Muskh-zamin; *Arab.*–Sadkoofi; *Kash.*–Chumkat; *Tam.*–Siru-pullady; *Mal.*–Munta-mandu.

Habitat

Is growing about 2 to 3 feet high throughout tropical India (Southern India).

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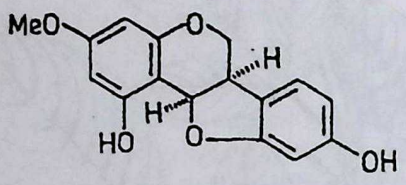
Constituents

A new antifungal isoflavonoid phytoalexin–desmocarpin–isolated together with genistein, 2′-hydroxygenistein, dalbergioiden, diphysolone and kievitone from fungus-inoculated leaflets; its structure determined.

New Compounds



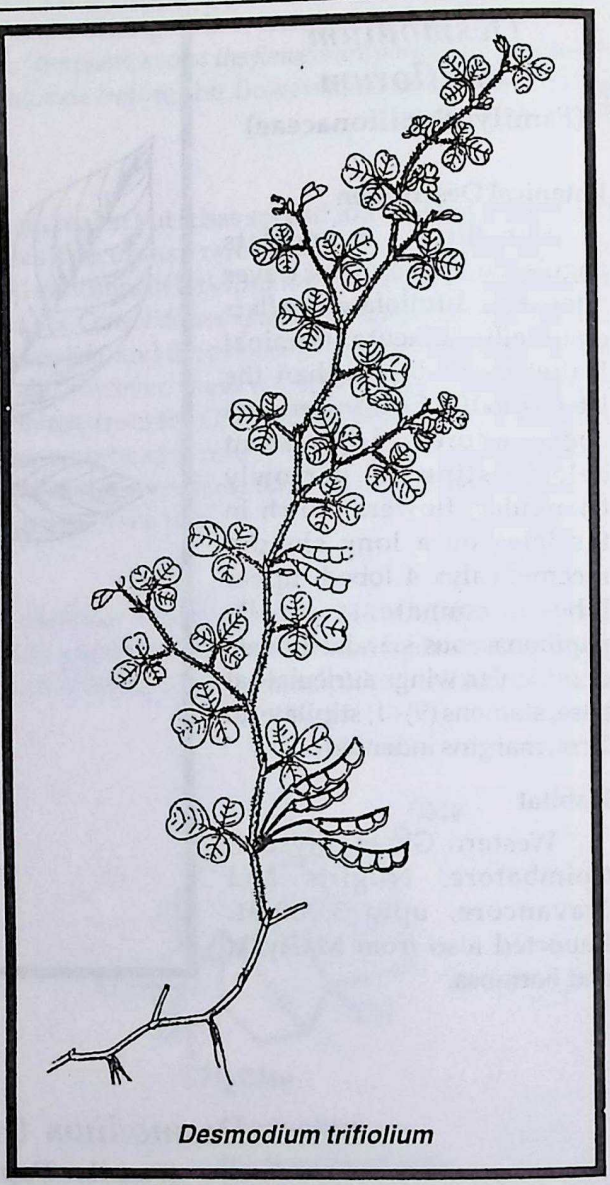
Desmocarpin

Biological Activity

Flavonoids of plant (20.0–200.0 mg/kg) injected (i.p., i.v. or via carotid artery) into experimental rats, mice, dogs and rabbits, markedly enhanced cerebral and myocardial capillary circulation, increased coronary and cerebral blood flow, increased tolerance to hypoxia, decreased blood pressure and reduced contraction of blood vessels. LD_{50} of flavonoids was 1.58 g/kg.

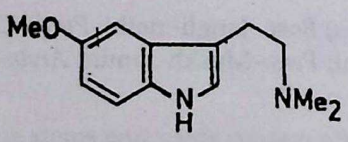
2″-O-Glucosylvitexin isolated together with (+)pinitol, apigenin, vitexin and isovitexin.

5-Methoxy-N, N-dimethyltryptamine, N, N-dimethyltryptamine, their N-oxides, N-methyltetrahydroman, 6-methoxy-2-methyl-β-carbolinium cation (regenerated from Reinecke salt) from aerial parts.

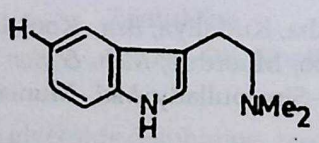


Desmodium trifiolium

New Compounds



5-Methoxy-N, N-dimethyltryptamine



N, N-dimethyltryptamine

Uses

Roots are considered carminative, tonic and diuretic and used in bilious complaints. Leaves are galactagogue; ground with cow's milk they are given daily in the morning. They are also given to

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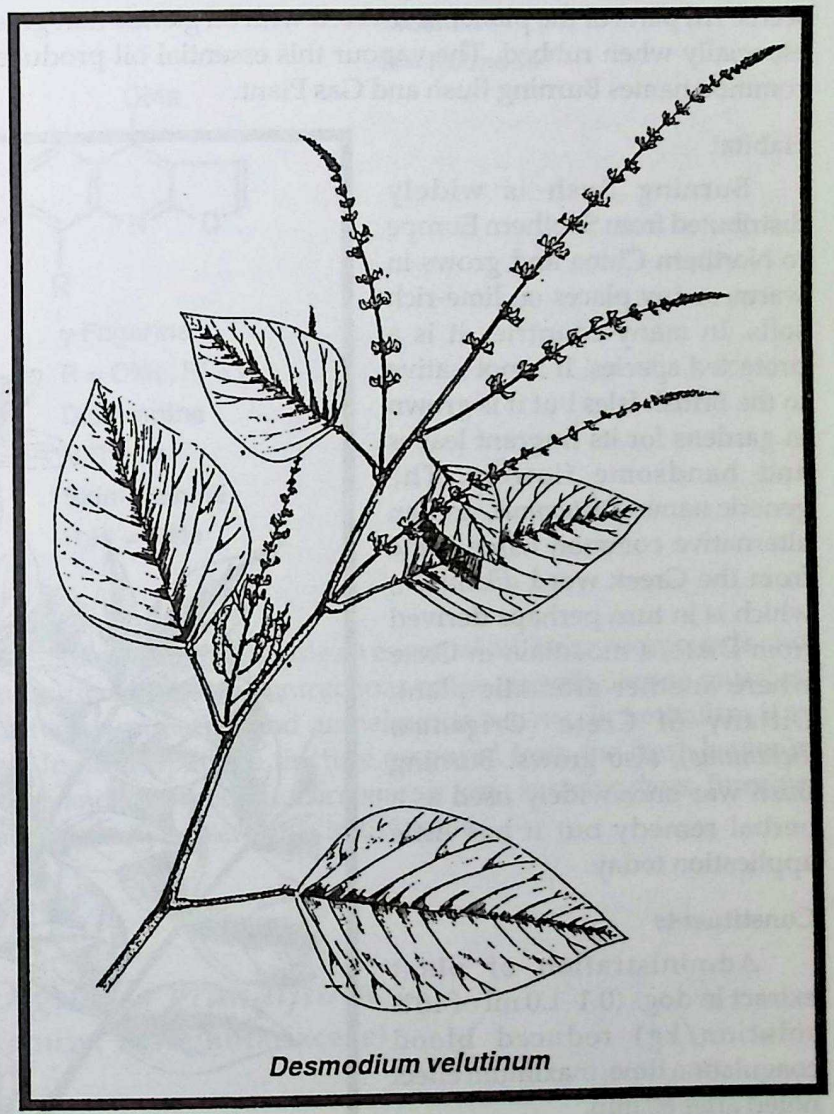
children for diarrhoea due to indigestion and also in convulsions. Fresh plant well bruised, its juice is applied to abscesses and wounds that do not heal readily. It is reputed to have diuretic action also.

Desmodium velutinum
(Family: Papilionaceae)

Botanical Description

Much branched under-shrubs; branches clothed with fulvous hairy tomentum; leaves unifoliolate, short-petioled, alternate, broadly ovate-acute to roundish, cordate, to 17 × 11 cms, pubescent above, tomentose below; flowers rose-purple in dense-flowered terminal raceme; pod to 2 cm indented on both margins, densely pubescent, seeds 1 mm across.



Desmodium velutinum

Habitat

The plant is distributed throughout South India. It is fairly common in N. Circars, hilly parts of Konkan, Western Ghats and Kerala, in dry open places. Also reported from Africa, Sri Lanka, Burma, Siam, Indo-China and Malaysia.

Uses

Prsniparni is one of the ten drugs that constitute the *dasamula* (ten roots) groups. The drug is reported to be a good cardiotonic, useful in the treatment of cardiac disorders. It is hot, sweet, diuretic, laxative and nervine tonic. It overcomes corruption of the three *dosas*, burning sensation, fever, cough, difficult breathing, dysentery, thirst and vomiting. It is also useful in *vatarakta*, insanity and ulcers. Root is the officinal part and it forms an ingredient of formulations like *Dasamularistam, Chyavanaprasam, Dhanvantaram kulambu*, etc.

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Dictamnus albus
(Family: Rutaceae)

Vernacular Name

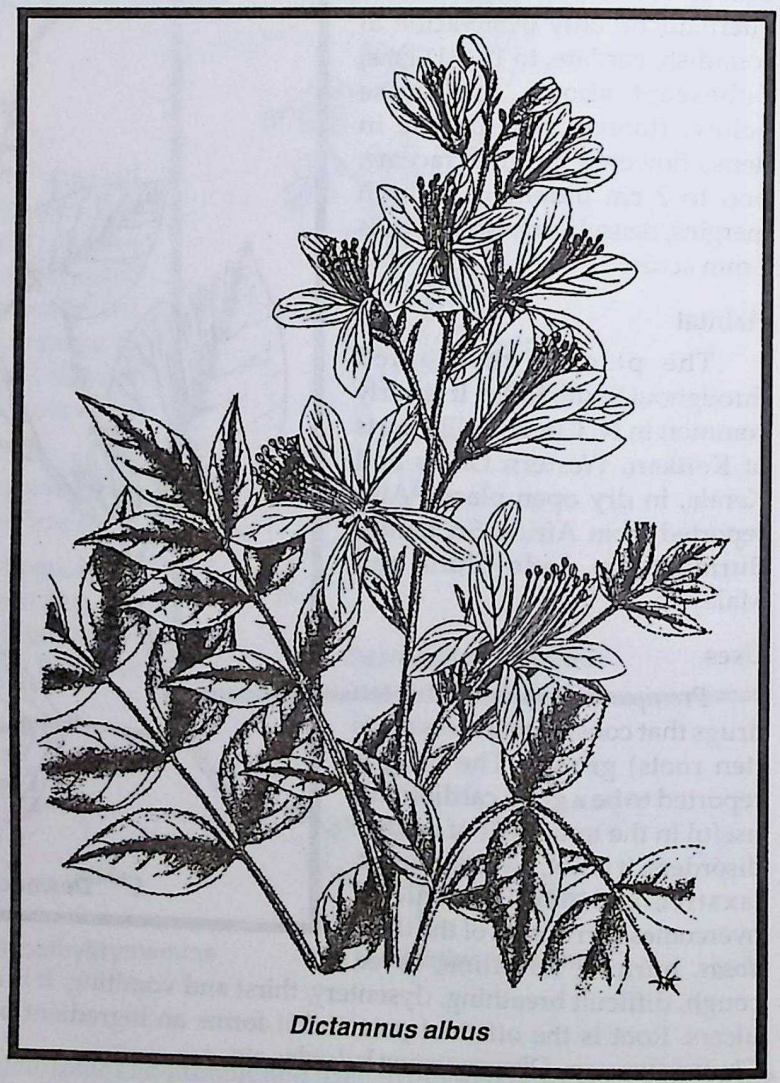
Eng.–Burning Bush.

Botanical Description

A bushy perennial herb with a whitish, branched rhizome, fibrous roots and erect branched stem. The alternate dark-green leaves are odd-pinnate, the leaflets lanceolate to ovate and finely serrate. The large, pinkish flowers are arranged in terminal recemes. The fruit is a star-shaped capsule with black seeds. All parts of the plant are covered with oil glands that give off a penetrating orange-like scent, especially when rubbed. The vapour this essential oil produces is inflammable, hence the plant's common names Burning Bush and Gas Plant.

Habitat

Burning Bush is widely distributed from Southern Europe to Northern China and grows in warm, sunny places on lime-rich soils. In many countries it is a protected species. It is not native to the British Isles but it is grown in gardens for its fragrant leaves and handsome flowers. The generic name, *Dictamnus*, and an alternative common name come from the Greek word *diktmnion*, which is in turn perhaps derived from Dikte, a mountain in Crete where another aromatic plant, Dittany of Crete (*Origanum dictamnus*), also grows. Burning Bush was once widely used as a herbal remedy but it has little application today.



Dictamnus albus

Constituents

Administration of plant extract in dogs (0.1–1.0 ml of 10% solution/kg) reduced blood coagulation time; maximum effect noted after 60 min.

Dictamnine] and other alkaloids present in roots whereas leaves contained traces of dictamnine, skimmianine

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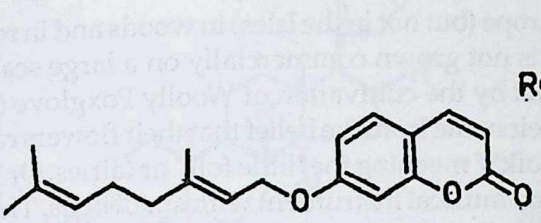
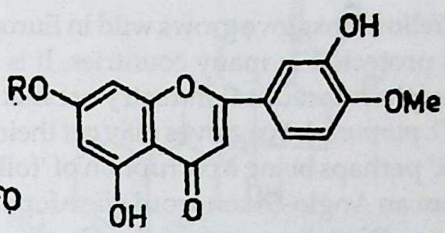
(β-fagarine) isolated; bergapten, 5-methoxypsoralen; rutin and another flavonoid detected by PC in leaves diosmin, m.p. 279°, isolated; γ-fagarine from roots; a coumarin–aurapten, m.p. 66°–from plant.

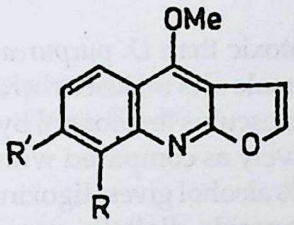
New Compounds



Aurapten



Diosmin
R = Rutinose



γ-Fagarine
R = OMe, R' = H
Dictamnine
R,R' = H
Skimmianine
R,R' = OMe

Uses

The rhizome is the medicinal part. Its constituents include an essential oil, bitter compounds and the alkaloid dictamine. Dictamine in particular causes contractions of the smooth uterine muscles. Burning Bush also has diuretic, laxative, carminative and anthelmintic actions. In herbalism it is prescribed in the form of an infusion. In homeopathy a tincture prepared from the fresh leaves is prescribed for gynaecological disorders and constipation. *Dictamine is toxic in strong doses.* Burning Bush can also cause allergic skin reactions in hypersensitive individuals.

Digitalis grandiflora
(Family: Scrophulariaceae)

Vernacular Name

Eng.–Large Yellow.

Botanical Description

A medium-tall hairy perennial herb with a taproot and alternate, lanceolate, serrate leaves, the lowermost ones in a rosette. The leaves further up the erect, unbranched stem are smaller and sessile.

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The large, bell-shaped, nodding flowers coloured pale ochre netted with brown inside are arranged in a long, terminal one-sided spike. The fruit is a capsule. *All parts of the plant are extremely poisonous.*

Habitat

Large Yellow Foxglove grows wild in Europe (but not in the Isles) in woods and in rocky mountain places. It is protected in many countries. It is not grown commercially on a large scale because the needs of the pharmaceutical industry are met by the cultivation of Woolly Foxglove (*D. lanata*) and Foxglove (*D. purpurea*). Foxgloves may get their name from the belief that their flowers resemble glove-fingers, 'fox' perhaps being a corruption of 'folk's' meaning the 'little folk' or fairies. Or 'glove' may be derived from an Anglo-Saxon word *gliew* for a musical instrument with small bells. The source of the generic name, *Digitalis*, was first the German *fingerhut* (= thimble) and then the Latin *digitus* (= a finger), again a reference to the shape of the flowers.

Constituents

Plant extract found to be more cardiotoxic than *D. purpurea* extracts at similar concentration. Extract of leaves administered to castrated male rats in doses corresponding to 1 and 3 mg digitalin/kg for 10 days increased the weight of the musculus levator ani by 12.3 and 37.38% respectively and total body weight by 5.3 and 7.2% respectively as compared with nerobol, a preparation of known anabolic effect. Extraction of leaves with 20% alcohol gives digoxin due to hydrolysis of lanatoside C.; eight glycosides–lanatosides A, B and C, stropeside, digitalin, verodoxin, gitoxin and acetyldigitoxin–separated by PC; scutellarein, luteolin and a new pigment–dinatin (scutellarein monomethyl ether), m.p. 274°–isolated from leaves; lanatoside complex content in plant was 0.227% (40% of total glycosides); it contained lanatosides A, B and C (49, 13 and 38% respectively); eighteen cardenolides identified by PC; acetyldigitoxin and digitoxin amounted to 0.0711 and 0.0126% respectively; hybrid of plant with *D. purpurea* contained mainly lanatoside A, with some lanatoside B but no lanatoside C; no purpurea glycoside A was present; lanatosides A, B, C, D and E, m.p. 240°, obtained from plant; a new glycoside –digitoxigenin glucosido-6-deoxy-glucoside–along with digoxin, gitoxin, digitoxigenin, gitaloxigenin, acetyldigitoxin lanadoxin acetylgitaloxin and acetylgitoxin isolated from leaves; synthesis of digitoxigenin; occurrence of 25β-tigogenin, m.p. 173°, 25α-digalogenin, m.p. 218°, and 25α-gitogenin, m.p. 244° in saponins of plant; spirostanol saponins–lanatigonin I, m.p. 275°, lanadigalonin I and lanadigalonin II–from seeds; 5,7,4'-trihydroxy-3',6-dimethoxyflavone from leaves; tigogenin, digitoxigenin, 3-epidigitoxigenin, m.p. 288°, digifolein, m.p. 199°, from leaves; new glycosides–digoxoside, m.p. 265°, neodigoxoside, m.p. 235° and acetyl-γ-digoxin–isolated from leaves; five primary glycosides–gluco-evatromonoside, m.p. 263°, gluco-gitoroside monohydrate, m.p. 237°, gluco-lanadoxin, m.p. 166°, odorobioside G monohydrate, m.p. 253° and gluco-verodoxin, m.p., 179°–isolated from unfermented extract of leaves; acetyldigoxin, acetylgitoxin and acetyldigitoxin detected by PC in mother liquor after separation of lanatosides; new primary glycosides–neo-odorobioside G, m.p. 272°, neo-digitalinum verum, m.p. 220°, and digitoxigenin-O-glucosyl-6-deoxyglucoside, m.p. 216°–from leaves; glucosides g7 and g8 identified as glucodigifucoside, m.p. 184° and neoglucodigifucoside respectively; digitoxigenin-β-D-glucoside isolated from leaves; 1-methoxy-2-methylanthraquinone, 3-methoxy-2-methylanthraquinone, digitolutein and 3- methylalizarin, m.p. 250°, isolated from leaves.

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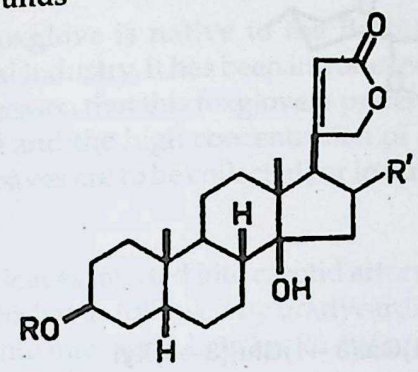
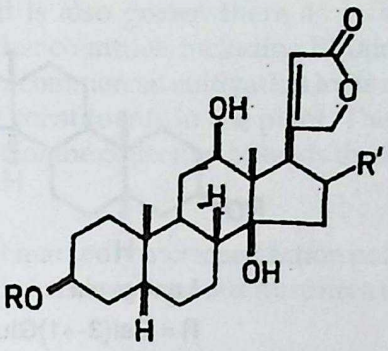
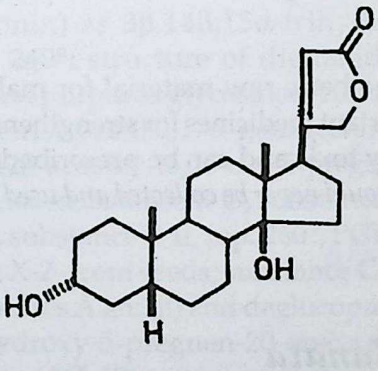
New Compounds



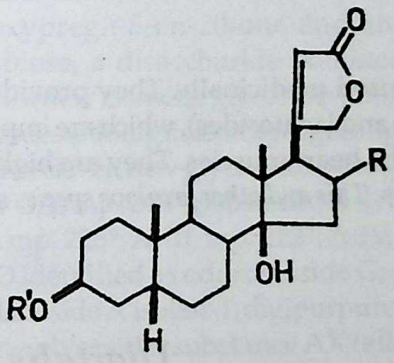
Digitoxigenin
R, R' = H
Lanatoside A
R = Digitoxose (4→1)digitoxose (4→1)
3-acetyldigitoxose (4→1)Glu, R' = H
Gitoxigenin
R = H, R' = β-OH
Lanatoside C
R = Digitoxose(4→1)digitoxose(4→1)
3-acetylgitoxose(4→1)Glu, R' = β-OH



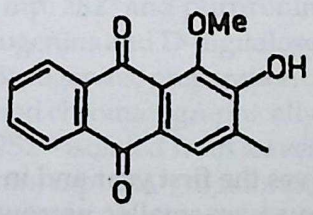
Digxigenin
R, R' = H
Lanatoside C
R = Digitoxose (4→1)digitoxose (4→1)
3-acetyldigitoxose (4→1)Glu, R' = H
Diginatigenin
R = H, R' = β-OH
Lanatoside D
R = Digitoxose(4→1)digitoxose(4→1)
3-acetyldigitoxose(4→1)Glu, R' = β-OH



3-Epidigitoxigenin



Gluco-evatromonoside
R = H, R' = Digitoxose(4→1)Glu
Gluco-gitoroside
R = OH, R' = Digitoxose(4→1)Glu
Gluco-lanadoxin
R = O-CHO, R' = Digitoxose(4→1)Glu
Odorobioside G
R = H, R' = Digitalose(4→1)Glu
Gluco-verodoxin
R = O-CHO, R' = Digitalose(4→1)Glu
Neo-odorobioside G
R = H, R' = Digitalose(2→1)Glu
Neo-digitalinum verum
R = OH, R' = Digitalose(2→1)Glu



Digitolutein

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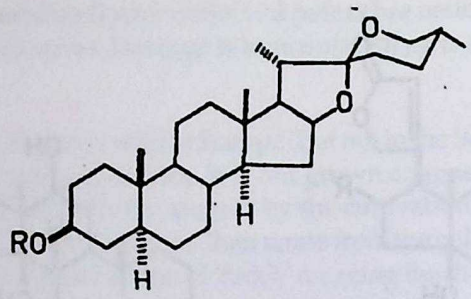

Lantigonin I

R = Gal(3→1)Glu[(2→1)Gal(3→1)Glu](3→1)Xyl

Biological Activity

Lethal doses of lanatoside, digitoxin, digitoxigenin, digoxin and digoxigenin in cat were found to be 1.16±0.046, 1.71±0.066, 0.60±0.031, 0.73±0.019 and 0.70±0.044 mg/kg, s.c. respectively. Relative inotropic molar potencies of digitoxin and digitoxigenin acetate were 4.1 and 0.43 respectively (compared with digitoxigenin), and those of digoxin and digoxigenin diacetate were 1.5 and 0.057 respectively (compared with digoxigenin) as measured in cat papillary muscle. Activity of derivatives of digitoxigenin and digoxigenin on isolated perfused guinea pig heart was determined by % increase in amplitude of contraction and mM producing cardiac arrest in 20-30 mins. The molar toxic activity of digitoxin was found to be 5.2 (compared with digitoxigenin as 1) and that of digoxin 10 (compared with digoxigenin as 1).

Uses

The leaves are used medicinally. They provide a basic raw material for making cardenolides (purpureaglycosides and lanatosides), which are important medicines for strengthening and regulating the contractions of the heart muscles. They are highly toxic and can be prescribed only by qualified medical practitioners. *This and other foxglove species should never be collected and used for self-medication.*

Digitalis lanata

(Family: Scrophulariaceae)

Vernacular Name

Eng.–Woolly Foxglove.

Botanical Description

A biennial herb which produces a rosette of basal leaves the first year and in the second year, a tall, erect stem with many sessile, lanceolate leaves. The leaves are smaller, narrower and less woolly than those of the common Foxglove (*D. purpurea*). The bell-shaped, brownish-white woolly flowers are arranged in a long, terminal spike. The flowers secrete abundant nectar and so are attractive to bees. The projecting lower lobe of the two-lipped flowers provides an alighting platform for the insects. The fruit is a capsule. *All parts of the plant are extremely poisonous.*

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Habitat

Woolly Foxglove is native to the Balkans and is also grown there as a field crop for the pharmaceutical industry. It has been introduced to other countries, including Britain, for commercial growing. The reason that this foxglove is preferred for commercial cultivation in its resistance to frost and to disease and the high concentration of active constituents in the plant. The seed is sown in spring (if the leaves are to be collected) or in autumn (for the collection of seeds the following year).

Constituents

Extract of leaves injected into carotid artery of cat markedly increased action potentials of carotid sinus nerve which was followed by bradycardia; i.v. infusion of aqueous purpurea extract (digitoxin content 86%) into mice gave LD50 as 26.4γ/g.

Gitaloxin, gitoxin and digitoxin content of leaves from different sources; gitostine, mp. 252° from seeds on hydrolysis gave gitoxigenin, glucose and digitalose (1:2:1); new glycosides–A-VI, mp. 237° (0.0022), C-1′ mp. 251° (0.0005), B-III, mp. 250° (0.0056), C-II, mp. 238° (0.0044), A-VII, mp. 242° (0.00005), A-VII′, mp. 221° (0.00007), B-II, mp. 214° (0.005), B-III′, mp. 240° (0.0015) and X-1, mp. 118° (0.025%)–from seeds; structure of C-II established as digitoxigenin-β-cellobiosido-β-D-fucoside (digifucocellobioside) and of B-III as digitoxigenin cellobiosido-tridigitoxoside (gitoxin cellobioside); deacylation studies on digitalinum verum hexa-acylates; digitoxin (0.75), gitoxin (0.035), purpurea glycosides A and B (0.095%) from leaves; saponins (1%) from leaves yield tigogenin and gitogenin by micro-sublimation; two isomers of gitogenin were found by PC; tigogenin is main constituent in leaves whereas major constituent of seeds is digitonin; hydrolysis of digipronin yields α-, β- and γ-digiprogenins; isodigipronin obtained by alkaline hydrolysis; structure of purpnigenin, mp. 239°, (aglycone of purpnin) as 3β,14β,15α-trihydroxypregn-5-en-20-one and chemical studies on purprogenin, mp. 249°; structure of digitanidobiose, a disaccharide obtained by hydrolysis of lanatosides A,B,C and purpurea glycosides A and B; a new isomeric glycoside–allodigitalinum verum–from seeds, characterised as 16ξ,17α-gitoxigenin glucosidodigitaloside; digacetigenin established as 3β,14β-dihydroxy-12β-acetoxy-15,20-oxo-5-pregnene; eleven new glycosides belonging to digitoxigenin and gitoxigenin series–substance B-O, substance PGA, mp. 248°, substance A-1, mp. 199°, substance A-II, substance B-I, substance B-II, mp. 260°, PGB, mp. 228°, A-III, mp. 222°, A-IV, mp. 248°, C-O, mp. 240° and substance X-2–from seeds; substance C-O identified as odorobioside G; purlanosides A and β (isomers of lanatosides A and β) and deglucopurlanoside A isolated; digipurpurogenin characterised as 3β,12α,14α-trihydroxy-5-pregnen-20-one; a new glycoside–substance AX (alloneogitostin)–from seeds characterised as 16ξ,17α-gitoxigenin-β-gentiobiosido-β-D-digitaloside; structure elucidation of a new flavone–digicitrin, mp. 178°–from leaves; previously reported digitanol glycosides–digipronin, mp. 235°, purpnin, mp. 282° and purpronin, mp. 278°–isolated from leaves; digipronin hydrolysate gave α-, β-, γ-digiprogenins and D-digitalose; hydrolysis of purpnin gave purpnigenin and digitoxose; configuration of digiprogenins; preparation of purpurea glycoside B, mp. 243°, from leaves; cardenolide glycosides determined chromatographically in extract of leaves; saponins–degalactotigonin, mp. 284° and F-gitonin, mp. 252°–isolated from leaves and structure of F-gitonin as gitogenin-3β-lycotetraoside established; digitonin, mp. 244°, digalonin, mp. 250° and deglucodigitonin isolated, molar ratio of their hydrolytic products (digitoxigenin, galactose, glucose, xylose) determined and structure of digitonin elucidated; water-soluble glycoside–gitalin–found to be mixture of 3 glycosides; two saponins from seeds found to be mixtures, one composed of 3 tetraglycosides (deglucotigonin, gitonin and deglucodigitonin) while second contained two pentaglycosides (digalonin and digitonin); preparation of various cardiac glycosides from leaves; digiprolactone, mp. 149°, isolated and found identical with

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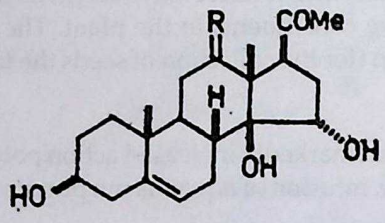
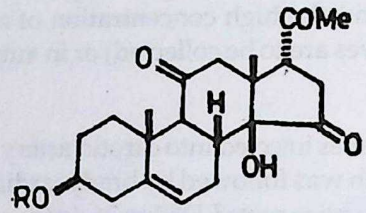
loliolide reported from Lolium perenne; 1-methoxy- and 3-methoxy-2-methylanthra-quinones, digitolutein and 3-methylalizarin, mp. 250°, from leaves.

New Compounds



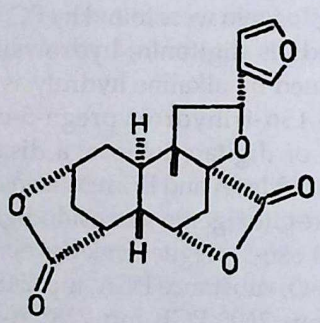
Purpnigenin
R = H,H
Purprogenin
R=O



Digipronin
R = Digitalose

Three new furanoid norditerpenes–diosbulbins A, mp. 265°, B, mp. 285° and C, mp. 247°,–from root tubers.

New Compounds



Diosbulbin B

Biological Activity

Acetone extract of rhizomes administered i.p. (10-45 mg/kg) 30 min. before food presentation, inhibited food intake during 90 and 300 min. in rats. Results compared with data obtained with cocaine HCl (6.0-9.0 mg/kg) and methylphenidate HCl (1.8 mg/kg).

Uses

The principal constituents of the leaves are the cardiac glycosides lanatosides A, B and C. digitoxin and digoxin. Therapeutically lanatosides are four times as potent as the purpureaglycosides of Foxglove. They, but especially digoxin, are used in medical practice in the form of tinctures, tablets, injections, suppositories and other preparations as cardioactive medicines that stimulate and regulate heart action in cases of arrhythmia, tachycardia (an abnormal increase in the heartbeat) and heart failure. These drugs can be prescribed only by qualified medical practitioners.

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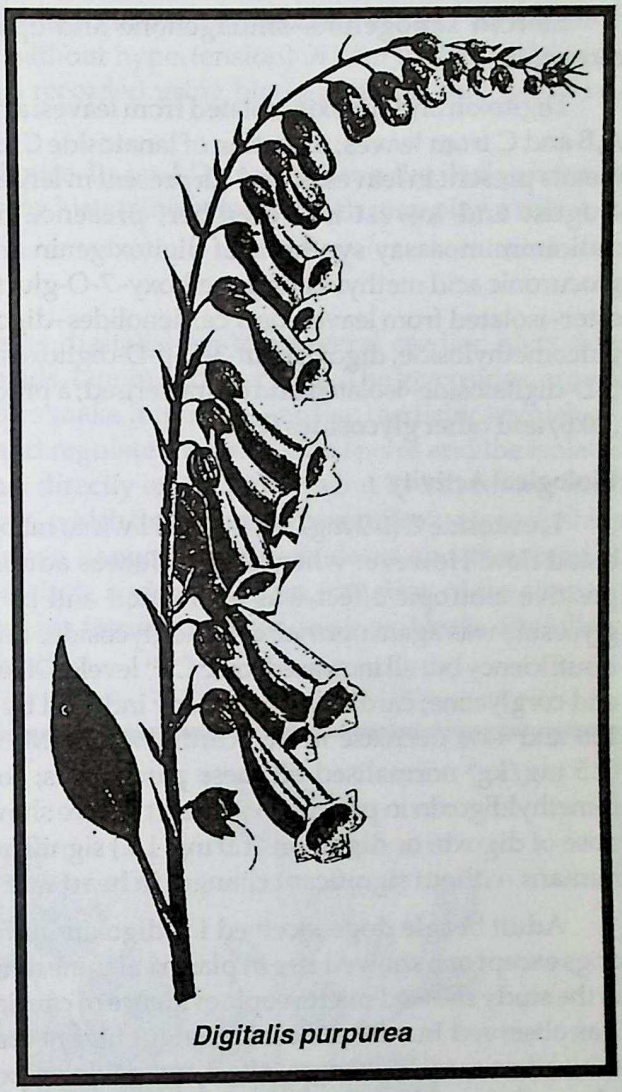
Digitalis purpurea
(Family: Scrophulariaceae)


Digitalis purpurea

Vernacular Name

Eng.–Foxglove.

Botanical Description

A biennial herb which produces a rosette of basal leaves the first year and, in the second year, a tall, erect, usually unbranched, hairy stem with only a few broad lanceolate, wrinkled leaves. The flowers are large, bell-shaped and pinkish mauve, occasionally white, with dark-purple spots on a white ground and hairs inside. The fruit is a capsule. The style persists on the top of the fruit after flowering. *All parts of the plant are extremely poisonous.*

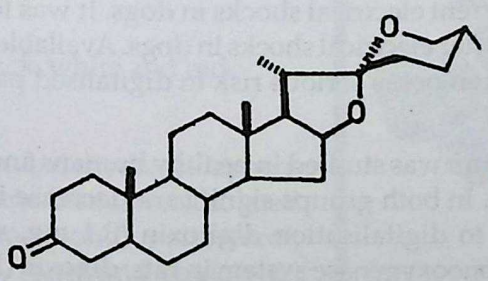
Habitat

Foxglove is common throughout Europe including most parts of the British Isles, in woodland clearings, heaths and on mountains, usually on acid soils. It is also a popular garden plant. For the pharmaceutical industry it is grown commercially as a field crop, but only occasionally in Britain (most British supplies come from abroad). Foxglove's action against dropsy, discovered by William Withering in the 1770s, led to the wide use of the plant in medical practice. The importance of this and other foxglove species in medicine has not diminished.

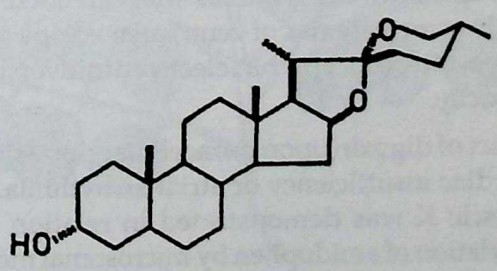
Constituents

Distribution of diosgenin in different parts of plant; smilagenone, mp. 188° and epismilagenin, mp. 220°, from yams; method for isolation of diosgenin.

New Compounds



Smilagenone



Epismilagenin

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Steroid sapogenins–smilagenone and epismilagenin–isolated from yams; preparation of diosgenin.

Digitoxin and digoxin isolated from leaves; a process developed for preparation of total glycosides A,B and C from leaves; detection of lanatoside C, digoxin and acetyldigoxin by TLC; determination of metals present in leaves; K and Ca present in largest amount; glycoside levels in plant highest in June-August and lowest in December; presence of cardenolides in all parts of plant shown by radioimmunoassay synthesis of digitoxigenin and epidigitoxigenin; new flavonoids–luteolin 7-O-glucuronic acid methyl ester, 6-methoxy- 7-O-glucuronide and 6-methoxy-7-O-glucuronic acid methyl ester–isolated from leaves; new cardenolides–digoxigenin-3-O-β-digitoxosido-β-D-digitoxosido-β-D-glucomethyloside, digoxigenin-3-O-β-D-digitoxosid-O-β-D-glucomethyloside and diginatigenin-3-O-β-D-digitaloside–isolated and characterised; a process developed for isolation of digoxin (60.0), gitoxin (20.0) and other glycosides (28.0).

Biological Activity

Lanatoside C (0.2 mg/kg) injected i.v. into rabbits with experimental acute heart overload increased blood flow. However when lanatoside was administered 1 day after whole body X-irradiation, the positive inotropic effect was attenuated and by 6th day after irradiation the response to cardiac glycoside was again normal; cardiac glycosides affected total serum Ca levels in patients with cardiac insufficiency but all increased ionic Ca^{2+} levels. Digoxin showed greatest effect followed by strophanthin and corglycone; cardiac insufficiency induced by aortal constriction in rat resulted, after 3 hr, in 43, 158 and 44% decrease in myocardial ATP, AMP and cytochrome C oxidase respectively. Digoxin (2.5 mg/kg) normalised all these parameters; comparative bioavailability studies of digoxin and β-methyldigoxin in patients with heart failure showed greater β-methyldigoxin bioavailability; single dose of digoxin or digitoxin (1.0 mg, i.v.) significantly increased myocardial contractility in healthy humans without significant changes in heart rate and blood pressure.

Adult beagle dogs received i.v. digoxin upto 30 days intended to induce minimal toxicity. All dogs except one showed rise in plasma alanine aminotransferase. Only the few dogs which died early in the study showed microscopic evidence of cardiac changes, although sub-endocardial haemorrhage was observed in others. Focal renal tubular necrosis was found in 10 out of 14 dogs and 5 of these showed no cardiac changes; effect of digoxin on exercise performance was studied in normal subjects who underwent a series of treadmill exercise tests before, 3 and 6 hr after i.v. administration of digoxin and on 7th day of daily oral digoxin and also at the end of one week. In all subjects resting heart rate and systolic blood pressure were significantly increased after i.v. administration. Pronounced effect of digoxin was reduction of tachycardia during exercise irrespective of routes of administration. Thus, persistent suppression of exercise-induced tachycardia after digoxin administration was observed in normal subjects; studies were made to determine whether nontoxic doses of digoxin increased risk of serious ventricular arrhythmias after direct-current electrical shocks in dogs. It was found that such doses do not increase risk of ventricular ectopy after electrical shocks in dogs. Available evidence does not support the concept that electrocardioversion poses serious risk in digitalised patients without overt toxicity.

Effect of digoxin upon intracellular potassium was studied in healthy humans and patients with mild cardiac insufficiency or atrial arrhythmia. In both groups significant decrease in total body K and muscle K was demonstrated in relation to digitalisation digitoxin (0.1 mg, s.c.) decreased demethylation of amidophen by microsomal monooxygenase system in rats; digoxin (2.5mg/kg, i.p.) increased liver Mg^{2+} level in rats but at 12.5 mg/kg it increased myocardial Ca^{2+} and decreased

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myocardial Mg^{2+} levels; digoxin and deslanoside produced marked cardiotonic activity (bradycardia followed by ventricular tachyarrhythmia with or without hypertension) *in vivo* in dog and *in vitro* atrial preparation. *In vitro* cardiac tension was also recorded using blood of donar dog which had shown cardiotonic effect.

Nepitrin increased survival time of irradiated mice. Its i.p. LD_{50} was 974 mg/kg. It significantly inhibited increase in capillary permeability caused by histamine in mice which may play a role in its radioprotective action.

Uses

The leaves of Foxglove (known in medicine as digitalis) contain several cardiac glycosides (purpureaglycosides A and B), saponins, organic acids, tannin and mucilage. The glycosides, among them digitoxin and gitoxin, are isolated and used to make important cardiac medicines which are used, like those of other foxgloves, to strengthen and regulate the heart. The leaves and the isolated glycosides are also strong diuretics. They do not act directly on the kidneys but by improving heart function they improve blood circulation to the kidneys, which then function more effectively in flushing out excess fluid from the tissues. The glycosides are dangerous in high doses and they tend to accumulate in the body. Symptoms of poisoning include abdominal pain, irritation of the stomach and bowel, nausea, abnormal heart action and perhaps tremors and convulsions. Death can follow. Digitalis preparations are available only on prescription.

Dolichandrone falcata, Seem.

(Family: Bignoniaceae)

Vernacular Names

Hind.–Hawar; *Bom.*–Manchingi; *Tam.*–Kadatathie.

Habitat

Peninsular India.

Action

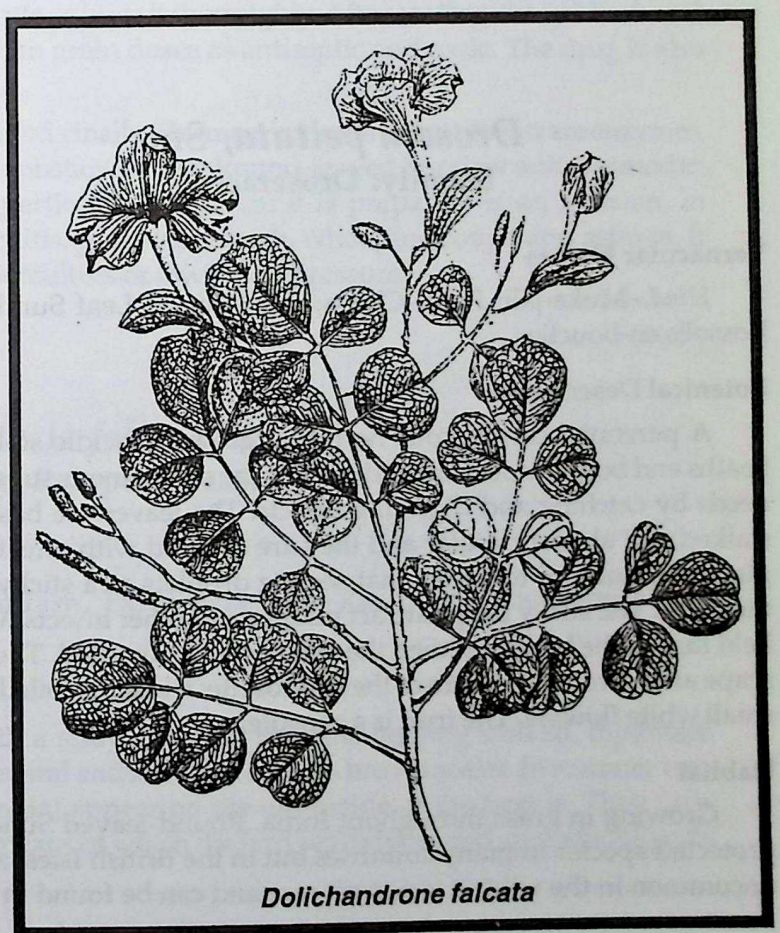
Abortifacient and a fish-poison.

Varieties

Three–black, white and red.

Constituents

Octacosanol, debydro-α-lapachone, lapachol and β-sitosterol isolated from stem heartwood; γ-sitosterol, dehydrotectol, tectol and paulownin isolated from stem bark.



Dolichandrone falcata

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Stem bark contained dehydro-α-lapachone, β-lapachone, lapachol, dehydrotectol, tectoquinone and β-sitosterol.

Illness : **Abdominal pain**

Part used : Pods

Preparation : 4 to 5 pods are crushed to make a fine powder.

Dosage : 1 teaspoonful of powder is to be taken with water in the morning and evening for 3 days.

Illness : **Swollen belly in cattle**

Part used : Bark

Preparation : A handful of bark is coarsely ground and put into 1 bottle of water to soak for at least half an hour.

Illness : **Toothache**

Part used : Leaves

Preparation : A fistful of leaves are boiled in water which is then strained.

Dosage : This water is used to gargle for 2 days.

Drosera peltata, Sm.
(Family: Droseraceae)

Vernacular Names

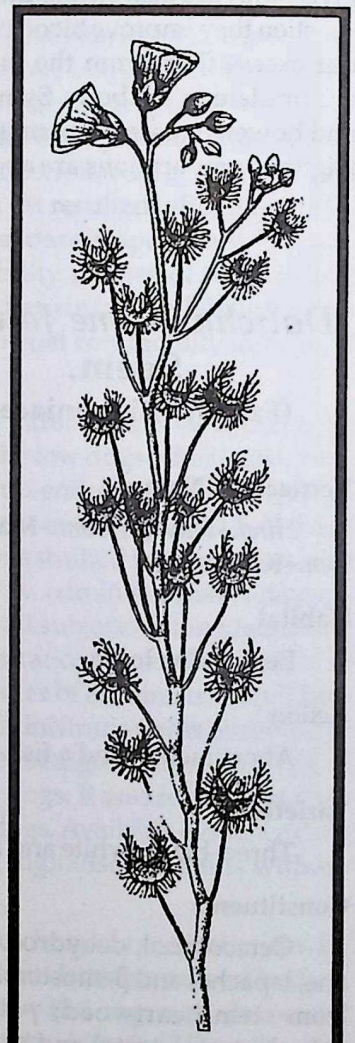
Hind.–Muka-jali; *Punj.*–Chitra; *Eng.*–Round Leaf Sundew; *Fr.*–Rossolis en-bouclier.

Botanical Description

A perennial carnivorous herb that grows in acidic soils in wet heaths and boggy moorland and obtains the nitrogenous substances it needs by catching and digesting insects. The leaves are basal, long-stalked and almost circular and they are covered with sensitive, red, glandular hairs or tentacles that secrete droplets of a sticky fluid at their tips. The sticky drops attract midges and other insects which are held fast on the hairs and then the soft parts are digested. The slender scape arises from the centre of the leaf rosette; it bears a coiled spike of small white flowers. The fruit is a capsule.

Habitat

Growing in grass throughout India. Round-leaved Sundew is a protected species in many countries but in the British Isles, although uncommon in the wild, it is not yet rare and can be found in suitable



Drosera peltata

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habitats throughout Britain and Ireland. A related species, Great Sundew (*D. anglica*), is also native to the British Isles. It has longer, narrower leaves than Round-leaved Sundew and has a more local distribution in wet peaty bogs, chiefly in Scotland and Ireland. Both species are vulnerable because of the increasing drainage and cultivation of moorland. The generic name, *Drosera*, is derived from the Greek word *drosos* (= dew), a reference to the fly-catching droplets that resemble dew on the leaves. Round-leaved Sundew is still used in herbalism and in homeopathy.

Parts Used

Leaves.

Constituents

A material from extract of leaves and stems, believed to be a mixture of hydroxynaphthoquinone and its derivatives, inhibited growth of *Mycobacterium tuberculosis, Proteus vulgaris, Bacillus subtilis, Escherichia coli* and *Staphylococcus aureus*.

Action and Uses

All the members of this Genus have a bitter, acrid or acid and caustic flavour and their leaves have the curious property of being insectivorous. These hairy leaves bruised singly or combined with salt are used as a blister in Kumaon. If placed in milk they rapidly curdle it. But a cold, infusion of this plant does not so act. Vaidyas use the plant for reducing gold to powder. They enclose the gold coin in the paste made of the plant and expose it to *puta* or burn it thoroughly. After cooling, the gold is found reduced to powder. Powder of gold is given in grain doses as antiseptic and tonic. The drug is also used in phthisis.

The leaves and flowering stems are used medicinally. The most important constituents are enzymes, glycosides, vitamin C and pigments. These substances give Round-leaved Sundew antispasmodic, sedative, hypoglycaemic and diuretic properties. In herbalism it is prepared as an infusion, in homeopathy as a tincture for treating bronchitis, persistent cough, whooping cough and asthma. It should not be taken by individuals with tuberculosis or low blood pressure.

Dryopteris felix, Mas.

(Family: Polypodiaceae)

Vernacular Names

Eng.–Male fern rhizome; *Ger.*–Warmfarn, Farnwarzel; *Fr.*–Racine de Foughere Male, Warmfarnwarzal.

Botanical Description

A large herbaceous perennial fern with a scaly creeping rhizome bearing stalked, bipinnate leaves (fronds). Young fronds are coiled in a spiral and are covered with brown scales. In summer two rows of green sori (round groups of sporangia) appear on the underside of the fronds. They turn brown as they ripen and produce spores by means of which the fern reproduces and spreads. *All parts of the plant are poisonous.*

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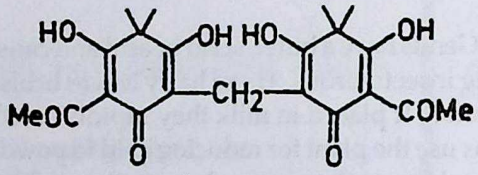
Habitat

Male Fern is common in shaded woods, on rocks and by streams throughout the British Isles. The generic name, *Dryopteris*, comes from the Greek words *drys* (= a tree) and *pteris* (= a fern). The common name is a translation of *filix-mas*, a term used by 16th century herbalists to distinguish this fern from another used then for female complaints. Male Fern has a long tradition as a remedy for expelling worms. It is still occasionally used but nowadays there are much safer anthelmintics.

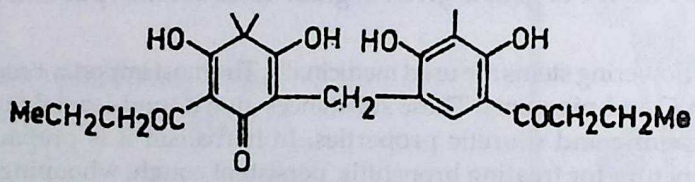
Constituents

Filicin, m.p. 92°, α-flavaspidic acid, m.p. 93°, albaspidin, m.p. 145° and filixic acid, m.p. 168°, from rhizomes; synthesis of filicinic acid; five acids identified in fronds–hexadeca-7,10,13-trienoic, octadeca-9,12,15-trienoic, eicosa-8,11,14-trienoic, eicosa-5,8,11,14-tetraenoic and eicosa-5,8,11,14,17-pentaenoic acids.

New Compounds



Albaspidin



α-flavaspidic acid

Uses

The rhizome along with the frond bases are used medicinally. The main constituents are an oleoresin, filicin, phloroglucinol compounds (for example, flavaspidic acid), starch and tannins. An ethereal extract is used in both human and veterinary medicine as an anthelmintic, especially against tapeworms. Male Fern preparations are strictly controlled and cannot be obtained from herbal practitioners. It is a dangerous plant; strong doses are very toxic and may lead to permanent blindness, even death. *Male Fern should never be collected and used for self-medication.*

Ecbolium viride

(Family: Acanthaceae)

Botanical Description

Woody undershrub; leaves simple, opposite, elliptic-ovate obtuse or acute, base narrowed down to a short petiole, 11 × 4.5 cms. glabrous green above, pale beneath flowers greenish blue in terminal

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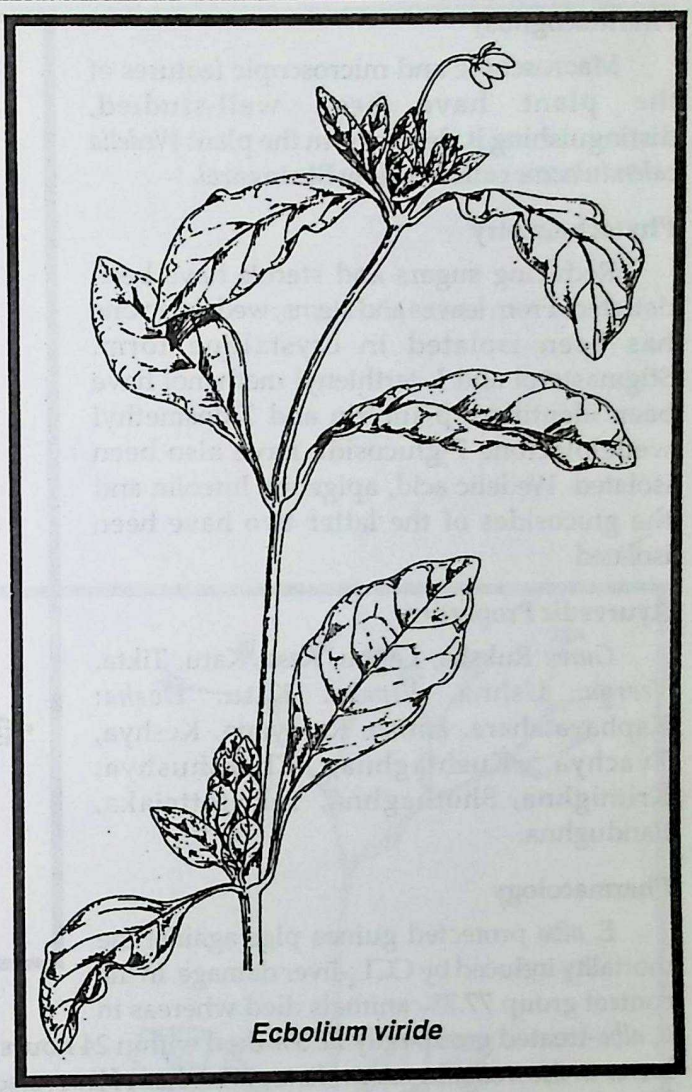
spikes; bracts large, green, orbicular or lanceolate, calyx lobes 5, subequal lanceolate, glandular-pubescent without; corolla tube slender, long, limb distinctly bilabiate, upper lip linear, lower lip spreading, 3-lobed; stamens 2, attached at the base of upper lip, exserted; capsule clavate, compressed seeds 2, orbicular, tuberculate or curved retinacula.

Habitat

Usually seen in waste places and exposed habitats. Distributed in Sri Lanka, India, Africa and Malaya.



Ecbolium viride

Eclipta alba, Hassk.
(Family: Compositae)

Vernacular Names

Sans.–Kesharaja, Bhringaraj; *Hind.*–Mochkand, Bhangra, Babri; *Ben.*–Kesuria, Kesutti, Kesuri; *Bom.*–Maka, Bhangra, Dodhak; *Tam.*–Kaikeshi, Karisha-langanni, Karisirang-kanni; *Tel.*–Galagara, Gunta-kalagara.

Historical Aspects

Vagbhatta ascribed to the plant the property of increasing longevity of a person. Bhavamisra mentioned in addition, medicinal properties for dental and skin diseases.

Botanical Description

This annual herb has a short, flat or round stem, deep brown in colour. Serrate leaves are opposite and sessile to subsessile. Small penny-size flowers, white in colour are on a long stalk.

Habitat

It is quite a common weed, like dandelion in the west, growing in moist places throughout the plains of India and upto 800 m above sea level.

Parts Used

Seeds, juice of leaves, herb, oil.

Constituents

β-Amyrin (0.06), wedelolactone (0.02) and luteolin-7-O-glucoside (0.04%) isolated from aerial parts; hentriacontanol, 14-heptacosanol and stigmasterol isolated from roots.

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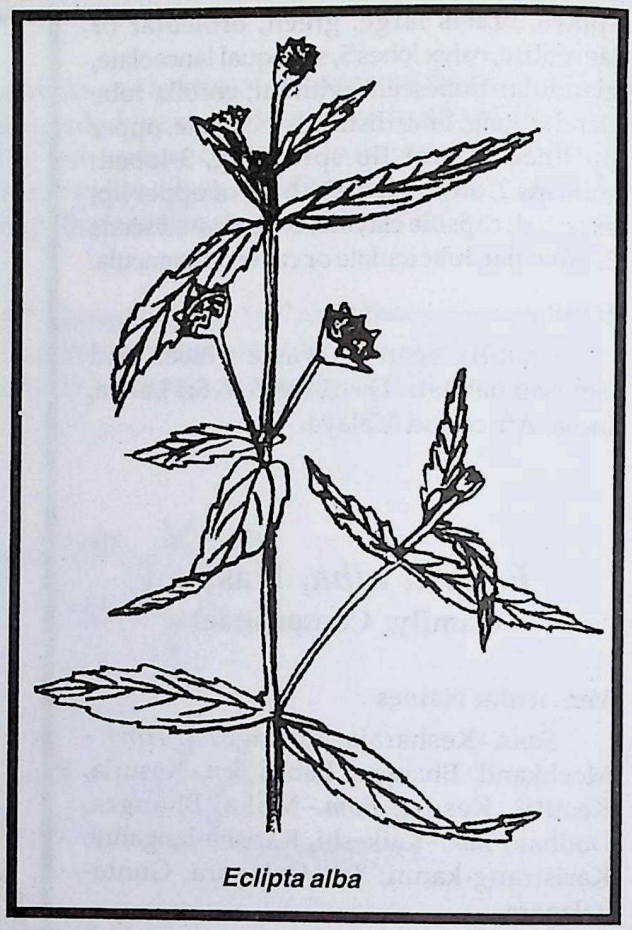
Eclipta alba

Pharmacognosy

Macroscopic and microscopic features of the plant have been well-studied, distinguishing it clearly from the plant *Wedelia calendulaceae* called yellow Bhringaraj.

Phytochemistry

Reducing sugars and sterols have been detected. From leaves and stems, wedelolactone has been isolated in crystalline form. Stigmasterol and L-terthienyl methanol have been identified. β-amyrin and 7-desmethyl wedelolactone-7-glucoside have also been isolated. Wedelic acid, apigenin, luteolin and the glucosides of the latter two have been isolated.

Ayurvedic Properties

Guna: Ruksha, Laghu. *Rasa*: Katu, Tikta. *Veerya*: Ushna. *Vipaka*: Katu. *Dosha*: Kaphavatahara. *Karma*: Rasayana, Keshya, Tvachya, Kushtaghna, Chakshushya, Krimighna, Shothaghna, Yakritottejaka, Pandughna.

Pharmacology

E. alba protected guinea pigs against the mortality induced by CCL_4-liver damage. In the control group 77.7% animals died whereas in *E. alba*-treated group only 22.3% died within 24 hours. Serum transaminases were also significantly lower in the treated group. Histopathology of liver also showed a reduction in parenchymal damage. There were similar findings in rabbits too. Only with fairly large doses *in vitro* the extract of *E. alba* showed negative inotropic and chronotropic effects. The alcoholic extract of the plant has shown antiviral activity against Ranikhet disease virus. Tranquilising action has been shown.

Safety

In the doses and formulations commonly used no adverse reactions have been reported. Only with large doses of the aqueous extract in animals a cardiodepressant effect was observed.

Clinical Usage

For healthy black arid long hair the plant is commonly used in hair oil all over India. The fresh juice of leaves is used for increasing appetite, improving digestion and as a mild bowel regulator. It is commonly used in viral hepatitis to promote bile flow and protect the parenchyma. It is popularly used to enhance memory and learning. The plant has a reputation as an anti-aging agent in ayurveda. It is also used as a general tonic for debility. Externally it is used for inflammation, minor cuts and burns and the fresh leaf-juice is considered very effective in stopping bleeding. Leaf juice mixed with honey is also used for children with upper respiratory infection. It is used in eye and ear infections.

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Indications

1. Viral hepatitis
2. Hair hygiene
3. Memory disorders
4. Minor cuts and burns
5. Conjunctivitis

Formulations and Dosage

1. Fresh leaf-juice: 6-12 ml b.i.d.
2. Seed powder: 0.5-1.5 gm b.i.d.
3. Bhringaraj taila:Hair application
4. Fresh leaf-juice: External application

Action

Tonic. Roots and leaves are cholagogues.

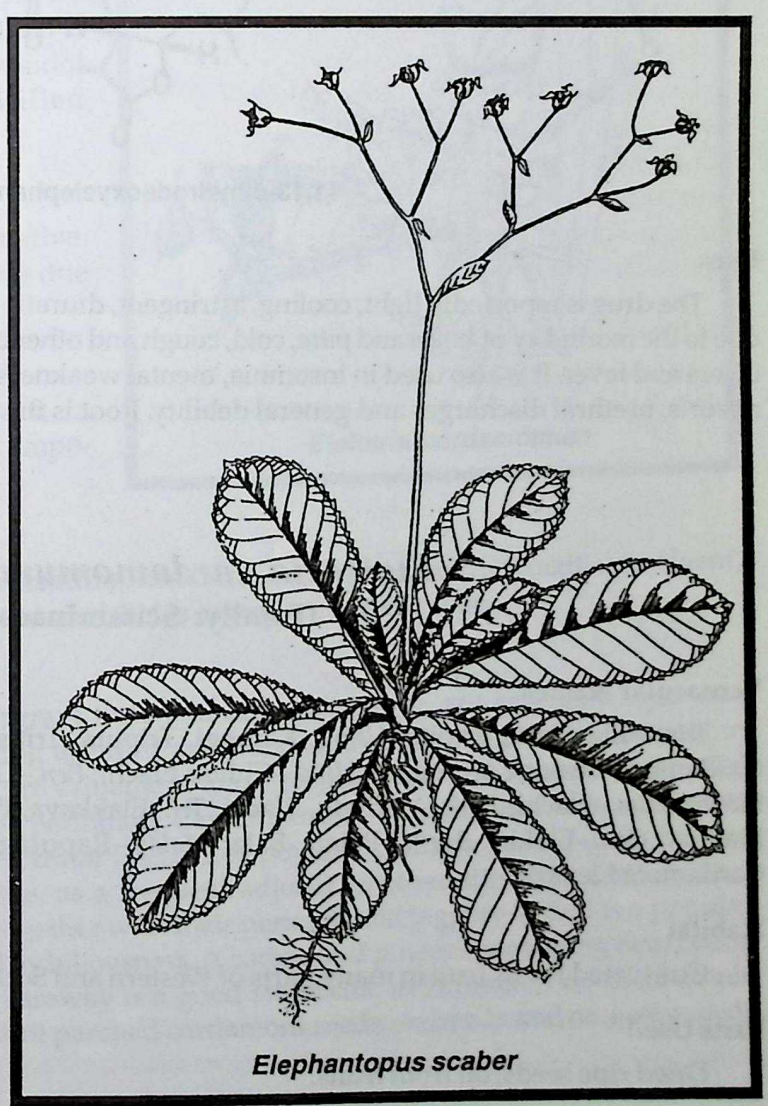
Uses

Roots and leaves are largely used alone or in combination with *ajowan* seeds in derangements of the liver and gallbladder. They have also been used as substitutes for Taraxacum, a reputed and popular liver tonic.

Elephantopus scaber, Linn.
(Family: Asteraceae)

Botanical Description

Scapigerous, hirsute herb; leaves radical, oblanceolate-spathulate, 10–14 × 3.5–5 cm, scabrid-hairy on both surfaces, leaves on the scapes small, bract-like; heads compound, few-flowered, homogamous, sessile, enclosed in an involucre of 3 leafy bracts; pappus bristles long, 4-6; corolla violet, tubular, deeply 5-cleft; stamens 5, exserted, filaments filiform,



Elephantopus scaber

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anthers oblong-linear; ovary oblong; faintly ribbed, hairy, style hairy above, shortly 2-fid, recurved; achenes 10-ribbed.

Habitat

Forest undergrowth in all districts, also as a weed in waste lands in plains in India. Also reported from Sri Lanka, Burma, Indo China, Malay Peninsula, Malaysia, Australia, tropical Africa.

Constituents

A new germacranolide dilactone–11,13-dihydrodeoxyelephantopin–isolated along with lupeol and stigmasterol.

New Compounds

11,13-dihydrodeoxyelephantopin

Uses

The drug is reportedly light, cooling, astringent, diuretic and good for the heart. It cures diseases due to the morbidity of *kapha* and *pitta*, cold, cough and other bronchial troubles, diabetes, hemopathy, ulcers and fever. It is also used in insomnia, mental weakness, constipation, jaundice, misperistalsis, dysuris, urethral discharges and general debility. Root is the officinal part.

Elettaria cardamomum, Maton.

(Family: Scitaminaceae)

Vernacular Names

Sans.–Ela, Truti, Kapita, Varni, Karangi, Triputa, Tritisukshmam; *Eng.*–Cardamom, Malabar Cardamom, Lesser Cardamom; *Hind.*–Chhoti Elachi; *Ben.*–Garate, Choti elachi, Chota Elachi; *Guj.*–Elachi; *Bom.*–Elachi; *Mah.*–Veldode, Elachi; *Tel.*–Elakkaya, Pakkuln; *Tam.*–Elakaya, Ella-kay, Elam, Elakgai; *Can.*–Elakki; *Burm.*–Palah, Bala; *Malay.*–Raputage-pinvar; *Pers.*–Kakilahe-Khurd; *Gr.*–Cardamom Elettarie.

Habitat

Cultivated for its fruit in many parts of Western and Southern India.

Parts Used

Dried ripe seeds; oil from fruits.

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Elettaria cardamomum

Constituents

Fixed oil, essential oil; volatile oil of the seeds- the active principle 4 to 8 p.c. and contains a considerable amount of terpinyl acetate; cineole; free terpineol, and probably also limonene are present. The following figures may be taken as covering most pure samples: specific gravity 0.923 to 0.945; optical rotation 24° to 48°; refractive index 1.4620 to 1.4675; acid value 1 to 4; ester value 90 to 150"; potassium salts, starch, nitrogenous mucilage, yellow colouring matter, ligneous fibre and ash containing manganese.

Presence of α-pinene (1.9), sabinene (4.5), myrcene (0.2), limonene (14.3), cineol (30.7), cymene (1.9), Me heptenone (0.8), linalool (0.9), linalyl acetate (1.2), β-terpineol (0.8), α-terpineol (3.7), α-terpinyl acetate (28.1), borneol (0.1), neryl acetate (0.3), geraniol (0.7), nerol (1.4), neolidol (0.3), heptacosane (0.5) and unidentified compounds (9.7%) in essential oil.

Action

Powerful aromatic, stimulant, carminative, stomachic and diuretic. These properties are due to the essential oil contained in the seeds.

Action and Uses in Ayurveda and Siddha

Small: kaphaharam, seetha veeryam, in swasam, kasam arsas, mootrakrichram, impotency.

Action and Uses in Unani

Small: Hot 2°, Dry 2°. Checks nausea, vomiting, headache, refrigerant, liquifies matter, resolvent, cardiac stimulant, absorbs moisture, expels wind, helps digestion, hepatic colic.

Uses

Cardamom seeds, which have a fragrant taste and aromatic odour, are generally used as a masticatory, (as a spice and as a flavouring agent). Cardamoms are employed to a small extent in Europe for flavouring sweetmeats. They are valuable in many stomach complaints. An oil extracted from the fruits is used both in pharmacy and perfumery. Cardamom may be safely used as a carminative is convalescence after diarrhoea. In the form of tincture or powder, cardamoms are used, both in Eastern and Western systems of medicine, as a frequent adjunct to other stimulants, bitters and purgatives. A decoction of cardamoms together with their pericarp and jaggery added is a popular home remedy to relieve giddiness caused by biliousness. A compound powder containing equal parts of cardamom seeds, ginger, cloves and caraway is a good stomachic in ½ drachm doses in atonic dyspepsia. A *powder* made of equal parts of parched cardamom seeds, aniseeds and caraway seeds

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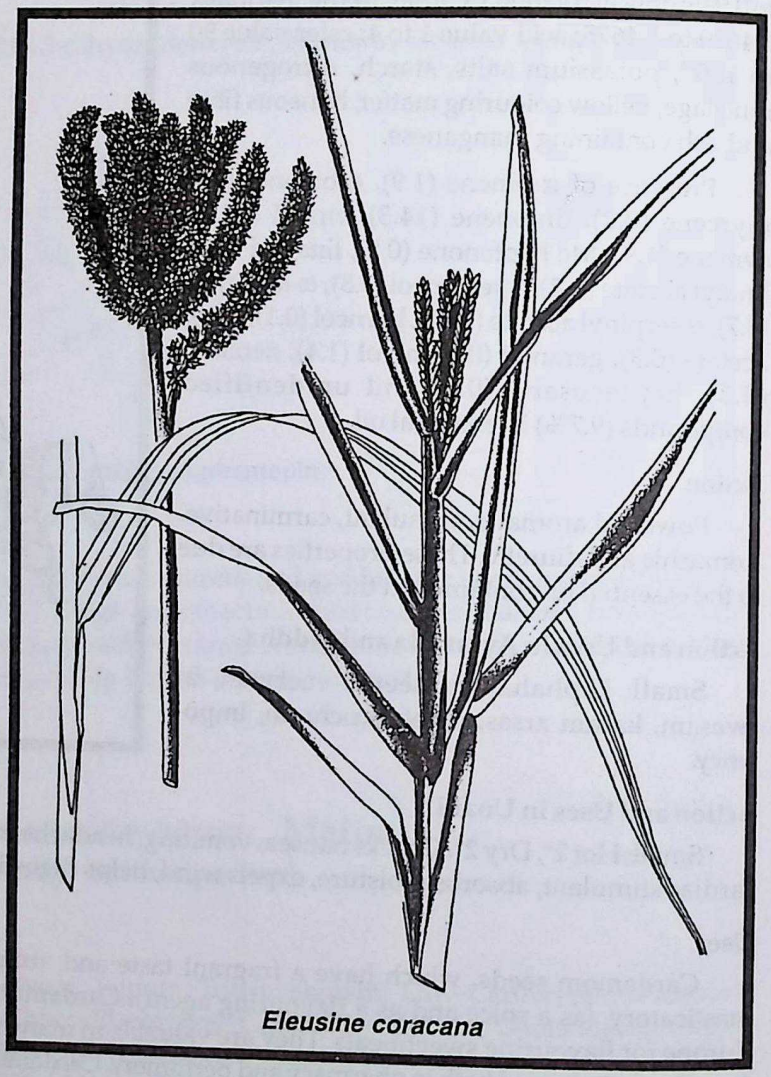
given in 1 teaspoonful doses is a good digestive. A powder made of the cardamom seeds 5 parts, resin of Shorea robusta 2 parts. Cyperus rotundus 4, Red sandal 2, long pepper 3, Cloves 2, and *Nagkesara* 1 part, is useful to check vomiting; dose-10 to 20 grains. A compound powder called *Eladi Churnam* composed of cardamoms 1 part, bark of Cinnamon 2 parts, flowers of Mesua ferrea 3 parts, black pepper 4 parts, fried borax 5 parts, long pepper 6 parts and sugar equal to their united measure, i.e., 21 parts is a good nutritive tonic and demulcent useful in bronchial affections, given in doses of 5 to 20 grains three times a day.

Eleusine coracana
(Family: Gramineae)



Eleusine coracana

Vernacular Names

Sans.–Soma, Rajika, Krishna; *Eng.*–Indian millet, Korakan; *Hind.*–Makra; *Sind.*–Nangli, Nagli; *Guj.*–Bavto; *Mah.*–Nachni; *Ben.*–Murooa; *Tel.*–Ragulu, Tamidalu; *Mal.*–Ragi; *Tam.*–Iragi; *Can.*–Ragi; *Kon.*–Nanchano; *Hind. & Pers.*–Mandua, Makra, Rotka; *Punj.*–Chzlodra; *Sinh.*–Kura-khan.

Habitat

This cereal grain is grown almost in all parts of India.

Parts Used

Seeds.

Constituents

Albuminoids, starch, oil, fibre and ash; Phosphoric acid 0.4 p.c. *Poona Ragi on analysis shows the following composition*: Moisture 14.3 p.c., Ether extract 1.34 p.c., Albuminoids 6.40 p.c. (Nitrogen 1.03), Soluble carbohydrates 73.34 p.c., Woody fibre 1.83 p.c., Ash 2.69 p.c. (sand nil). *Mysore Ragi*-13.22, 1.20, 5.39 (nitrogen 0.86), 75.13, 2.10 & 2.98 (sand nil) respectively.

Action and Uses

This grain, though very wholesome, is rather difficult of digestion and unpalatable, but highly proteinaceous and nourishing foodstuff; it is most suitable to hard-working classes. Cakes made from ripe grain are very dry eating and thus it is considered to be an economic grain. *Ragi* is said to be very

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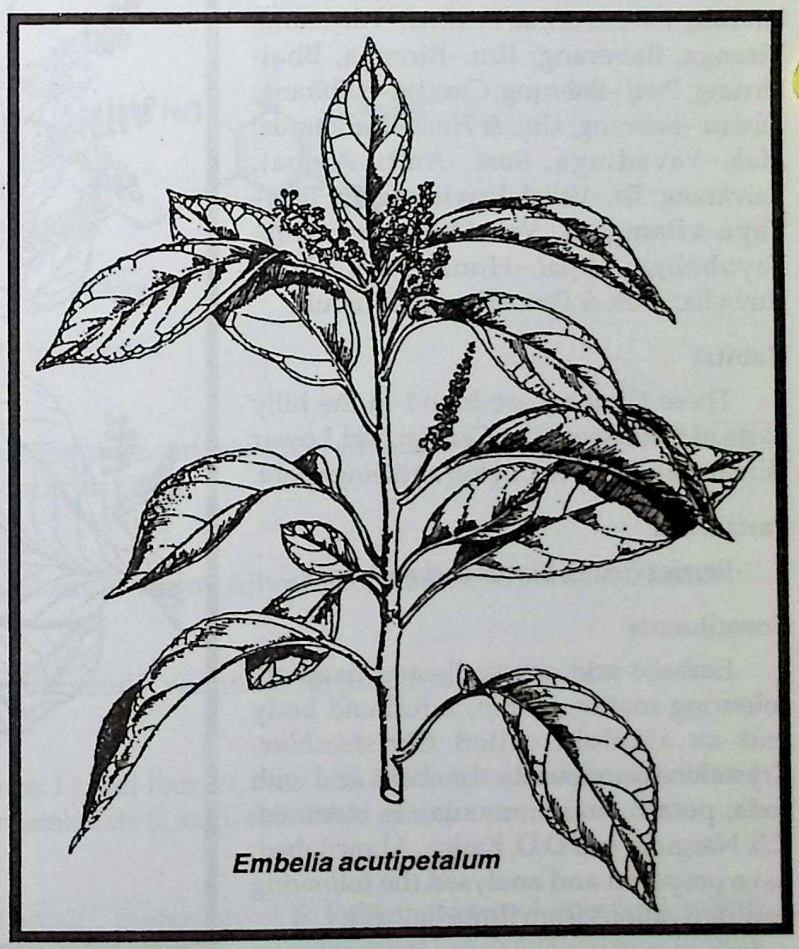
nutritious, even more so than what, and is an important food of the poorer classes. The population of the Mysore plateau, especially the lower classes, eat a great deal of this nutritious foodstuff in addition to rice, and as such that keep better health and have better physique than the rice-eaters of Southern India. Flout is made into a cooling drink called *ambil* (Marathi) in the Southern Mahratta country and in Mysore the flour is used for puddings or made into cakes which are fried in oil; in other parts of India, a fermented liquor is prepared from the grain. *Ragi* forms a principal diet given to prisoners in some of the Indian jails. The allied species *E. aegyptiaca* names *Makra* occurring in Upper India is reputed as an alleviator of pains in the region of the kidney. It is given in the form of *decoction* of the seeds and its herbaceous parts are applied externally for the cure of ulcers. *Ragi Kanji* (*Chodi Kanji*) with buttermilk in the morning is a diet in diabetes. Under the name of *burda* (Marathi), the green heads are parched and eaten. The grain is indestructible and can be preserved for more than fifty years in dry grain *pits*. The straw, powder and mixed with chaff, is used as fodder but it is of poor nutritive value.

Embelia acutipetalum

(Family: Myrsinaceae)



Botanical Description

Erect, shrub, leaves simple, alternate, broadly elliptic to obovate, cuneate, abruptly acuminate, dentate, upto 14 × 6.5 cms, green above, pale and reticulate beneath; flowers greenish white in axillary simple racemes; petals papillose within; stamens exserted, orbicular, mucronate, glandular on the back; fruits red.

Habitat

The plant grows in most deciduous forest and in plains in the districts in the circars and Deccan; along W. Ghats upto about 3,000 ft.

Uses

As the synonyms *vidanga*, *vellam* and *krmighna* indicate, the drug is highly esteemed as a powerful anthelmintic and is an important ingredient of a number of formulations. In recent times,

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vidanga gained particular importance in view of the wide experimental and clinical trials on its contraceptive potentiality.

Dried berries, which form the officinal part, are light, acrid, astringent, alterative, carminative and nervine tonic and are used for constipation, colic, dyspepsia, flatulence and piles. The drug overcomes diseases due to the morbidity of *kapha* and *vata* and cures leprosy and other skin diseases. A paste of the seeds is applied locally against ringworm and other cutaneous affections. The seed powder is used as an errhine in cold and headache. Root improves digestion and cures flatulence and colic. Powder made from dried bark of the root is a reputed remedy for tooth ache. The drug enters into the composition of formulations like *Vilalveradi kasayam, Anutailam, Abhayaristam, Gulgulutiktakam kasayam*, etc.

Embelia ribes, Burm.
(Family: Myrsinaceae)

Vernacular Names

Sans.–Vidanga, Vrishanasana, Chitra-tandula, Janthunashana; *Hind.*–Wawrung, Viranga, Baberang; *Ben.*–Biranga, Bhai-birrung; *Punj.*–Babrung; *Gwalior.*–Baibirang; *Pushtu.*–Babrang; *Guj. & Hind.*–Karkannie; *Mah.*–Vavadinga; *Bom.*–Amti, Ambat, Vaivarang; *Tel.*–Vellal, Vaividungalu; *Tam.*–Vayu-vilamgam, Vaividangam; *Can.*–Vayubaliga; *Nepal.*–Himalcheri; *Sinh.*–Umbelia; *Arab. & Pers.*–Birangi-i-Kabuli.

Habitat

These climbers are found in the hilly parts of India from the Central and Lower Himalayas down to Ceylon and Singapore.

Parts Used

Berries (fruit), leaves and root-bark.

Constituents

Embelic acid, a volatile and fixed oil, colouring matter, tannin, a resinoid body and an alkaloid called *Christembine*. Crystalline compounds of embelic acid with soda, potash, and ammonia are obtained. K.S. Nargund and D.D. Kanga, Ahmedabad, have prepared and analysed the following new derivations from Embelic Acid:

Embelia ribes

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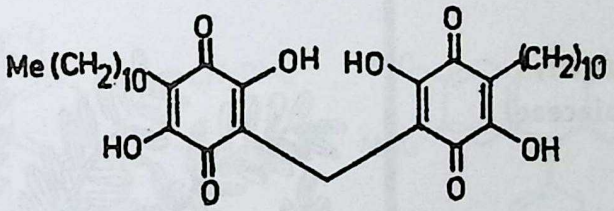
(a) a monoacatyl derivative: m.p. 57°–58°
(b) a monosemicarbazone: m.p. 205°–206°
(c) a disecomicarbazone: m.p. 255°–256°
(d) a dihydrazone: m.p. 178°–180°
(e) an oxime: m.p. 178°

A colourless crystalline constituent '*Vidangin*' from the berries, has m.p. 115°–116°; on the oxidation it gives orange flakes m.p. 142°C. It gives a dark coloured aliphatic oil and an orange-coloured yellow crystalline substance Embelin, formula $C_{18}H_{28}O_4$. Embelin contain two hydroxyl groups and two Ketonic groups and two methylene groups. These groups are called of Keto-enol tentomerism. Embelin on crystallisation yields long yellow needles m.p. 142°. Presence of two Keto groups is proved in the molecule. Embelin m.p. 143°

Embelin oxidised by nitric acid of various dilutions have been definitely isolated and identified from among the oxidation product, normal lauric acid, oxalic acid, lauronitrile and lauramide. In the light of these findings, who report the isolation of isolauric acid in the oxidation of Embelin, have been doubted, and those of Hefter and Feuerstein confirmed.

A new compound–vilangin (0.06%), mp. 264°, identified as methylenebis-(2,5-dihydroxy-4-undecyl-3,6-benzoquinone)–isolated from berries; isolation, structure and synthesis of vilangin.

New Compounds



Vilangin

Isolation of vilangin from plant and ripe berries.

Action

Fruits or dried berries (seeds) are carminative, anthelmintic, stimulant and alternative. Pulp is purgative. Fresh juice is cooling, diuretic and laxative.

Action and Uses in Ayurveda and Siddha

Katurasam, ushna veeryam, lagu, diksham, in sollam, adhmanam, udaram, krimi vatavi-bandam.

Action and Uses in Unani

Hot 2°, Dry 2°, purgative of balgam, and souda, vermifuge, in puerperal condition.

Preparation

Decoction (1 in 10), *dose*: ½ to 1 ounce; Liquid Extract, *dose*: 1 to 4 drachms; Powder, *dose*: 1 to 4 drachms; Paste; Confection; Ammonium embelate (a salt), *dose*: 3 to 6 grains.

Uses

Dried berries (seeds) are useful as *powder*, preferably of E. Robusta to expel intestinal worms especially tape-worms. For a child a drachm or two of the powder mixed with a few drops of pure

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honey or sugar, administered in an empty stomach or twice in the day is the dose to expel tape-worms. The *Ammonium embelate* in doses of 3 grains is also effective; it is given with a little honey or syrup, preceded and followed by a dose of castor oil.

Powder may be given also with an *infusion* of the seeds. The worm is expelled dead. The drug can be a substitute for male fern; better than male-fern as it is not so griping as male-fern. Berries prevent flatulence and are useful in dyspepsia; a few berries or their powder is put into the milk given to children. *Fruit* of E. robusta is given internally for piles. *A paste of the seed* is used locally in ring-worm and other skin diseases. *Young leaves* of the plant combined with ginger are used as a gargle in sorethroat, aphthae and indolent ulcers of the mouth. Powder made from dried bark of the root is a reputed remedy for toothache. A paste of the bark is a valuable application to the chest in lung diseases like pneumonia etc., in such cases rice-conjee in which this bark is boiled is given internally. Berries crushed and mixed with butter is an ointment applied to the forehead in headache. This drug enters into the composition of several applications for ringworm and other skin diseases, for example: Take of *Baberang*, rock salt, chebulic myrobalan, Veronia anthelmaintica, mustand, turmeric and the seeds of Pongamia glabra equal parts and make them into a thin paste with cow's urine. *Vidanga Taila* composed of embelia ribes, Croton tiglium and Carbonate of sodium is applied to the forehead or dropped into the nose for relieving headache or hemicrania. The drug is also used in scorpion-sting and snake-bite.

Emblica officinalis
(Family: Euphorbiaceae)

Emblica officinalis

Vernacular Names

Sans.–Dhatri-phala, Amraphalam, Amalakam, Sriphalam, Amalaki, Vayastha; *Eng.*–Emblic Myrobalan, Indian gooseberry; *Ger.*–Gebrauchlicher, Amlabaum; *Fr.*–Phyllanthe Emblic; *Hind.*–Amla, Aoula, Aura, Amlika, Anvurah; *Bom.*–Amla, Avalkati; *Ben.*–Amlaki, Amla; *Mah. & Gwalior.*–Avla, (seed) Avalkati; *Tel.*–Nelli, Usrikayi, Amalakamu, Usiri; *Tam.*–Toppi, Nellikkai; *Mal. & Can.*–Nellikai; *Sinh.*–Nelli, Nellika; *Burm.*–Ziphiyu-si, Shabju; *Punj.*–Ambli, Ambul, Ambal, Amla; *Guj.*– Ambala, Amla; *Kash.*–Aola; *Arab.*–Amlaj; *Pers.*–Amala, Amuleh, Amial; *Assam.*–Amluki; *Nepal.*–Amla; *U.P.*–Amla, Asula; *Uriya.*–Amlaki; *Santal.*–Meral.

Habitat

The Deccan, the sea-coast districts and Kashmir. Throughout Indian plains, more common in peninsular India ascending to about 1000 m in hills.

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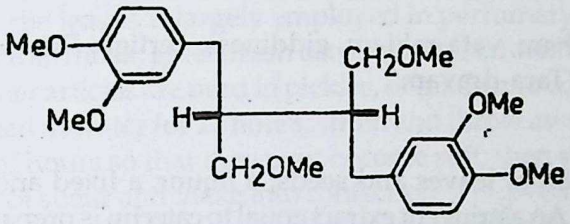
Parts Used

Dried fruit, the nut or seed, leaves, root, bark and flowers. Ripe fruits used generally fresh, dry also used.

Constituents

Improved method of isolation of phyllanthin and hypophyllanthin from leaves; formed characterised as (+)3,3′,4,4′,9,9′-hexamethoxy-8,8′-butyrolignan.

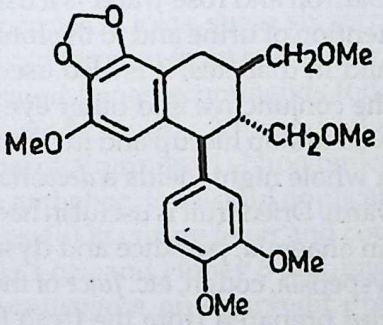
New Compounds



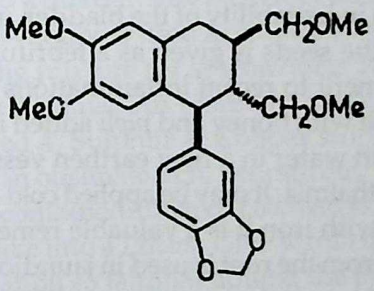
Phyllanthin

Structure of hypophyllanthin revised on basis of 13C-NMR spectroscopy; new lignan–lintetralin–isolated; lintetralin and phyltetralin synthesised; new alkaloid–4-methoxynorsecurinine–isolated together with 4-methoxysecurinine (= phyllanthine) and characterised.

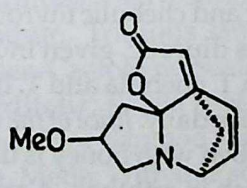
New Compounds



Hypophyllanthin



Lintetralin



4-Methoxynorsecurinine

Action

Fresh fruit is refrigerant, diuretic and laxative. Green fruit is exceedingly acid. Fruit is also carminative and stomachic. Dried fruit is sour and astringent. Flowers are cooling and aperient. Bark is astringent.

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Action and Uses in Ayurveda and Siddha

Rasa, all except lavana, kashayam dominates, seetha veeryam, mathura vipakam, tridosha, haram, rasayanam, increases sukram.

Action and Uses in Unani

Cold 2°, Dry 3°–refrigerant, heart-tonic, tonic to brain, prevents vicious humours in stomach and intestines. Used in chronic diarrhoea, in the convalescent stage of typhoid and other fevers.

Indications

Rakta-pittam, prameham, vata-raktam, giddiness, vertigo. *External use*: In mental disorders as paste and tailam to head. 'Tara-dravam'.

Preparation

Decoction and infusion of leaves and seeds; a liquor, a fixed and an essential oil; confection; powder; paste and pickles. An astringent extract equal to catechu is prepared from the root by decoction and evaporation.

Uses

Fresh fruit is used in Turkeystan in inflammations of the lungs and of the eves as a collytium. In Persia it is used as a vermifuge; *juice* of the fruit is used; it is generally given with honey; the dose is from 1 to 3 drachms. The green fruits are made into pickles and preserves to stimulate appetite. A *paste* of the fruit alone or with Nelumbium speciosum, Saffron and rose water is a useful application over the pubic region in irritability of the bladder, in retention of urine and to the forehead in cephalalgia. An infusion of the seeds is given as a febrifuge and in diabetes; it is also used as a collyrium and applied with benefit to recent inflammations of the conjunctive and other eye complaints. Juice or *extract* of the fruit with honey and *pipli* added is given to stop hiccup and in painful respiration. *Dried fruit* immersed in water in a new earthen vessel a whole night yields a *decoction* which is used as a collyrium in ophthalmia. It may be applied cold or warm. Dried fruit is useful in haemorrhage, diarrhoea and dysentery; with iron it is a valuable remedy in anaemia, jaundice and dyspepsia. A fermented *liquor* prepared from the root is used in jaundice, dyspepsia, cough, etc. *Juice* of the fresh fruit and ghee mixed together is a good restorative tonic. A *sherbat* prepared from the fresh fruit with or without raisins and honey is a favourite, cooling drink which has a diuretic effect. A *decoction* made by boiling 4 drachms each of the powder of emblic and chebulic myrobalans and one drachm of rhubarb powder in a pint of water is a laxative as well as diuretic, given in 2 ounce-doses to sick people. A decoction prepared from the fruit combined with T. chebula and T. belerica is useful in chronic dysentery and biliousness, in doses of 1 oz. once or twice daily. *Juice of the bark* combined with honey and turmeric is a remedy for gonorrhoea. *Root bark* rubbed with honey is used in aphthous stomatitis. A decoction of the leaves is also useful as a mouth wash in aphthae. A mixture of the fruit juice and sugar relieves burning in the vagina. *Leaves* are used as infusion with fenugreek seeds in chronic dysentery and as a bitter tonic. For loss of taste after fevers a *decoction of the emblic seed*, dried grapes and sugar is used for gargling. A decoction of the emblic seed, *chitrak* root, chebulic myrobalan and *pipli* is given in fevers; so also a *compound powder* made of equal parts of the emblic seed, *chitrak* root, chebulic myrobalan, *pipli* and *saindhava* is used similarly. A powder of the emblic seed and red sandal is given with honey to stop nausea and vomiting. *Seed* fried in ghee and ground in *conjee* is applied as *Lep* to the forehead to stop bleeding from the nose. Seed burnt, powdered and mixed in oil is a useful application for scabies or itch. One tola of the seeds soaked in a tinned vessel during the night, and ground next

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morning, with cow's milk and take in 7 tolas or ¼ seer of milk is a good remedy for biliousness. A powder made of the equal quantity of emblic seed and root of Withania somnifera given with ghee and honey is a restorative invigorator, especially in winter days. Half a drachm each of the emblic seed and *gokhru* powdered and mixed with 15 grains of essence of *Gulancha* and given early morning in ghee and sugar is an equally nutrient tonic. For diarrhoea of children, a compound powder of the emblic seed, *Chitrak* root, chebulic myrobalan, *pipli* and *palelone* is given in suitable doses according to age, in warm water twice daily, morning and at bed time. *Milky juice* of the leaves is a good application to offensive sores. A *fixed oil* obtained from the berries strengthen and promote the growth of hair. *Essential oil* distilled from the leaves is largely employed in perfumery. *Tender shoots* given in butter-milk cure indigestion and diarrhoea; green fresh leaves combined with curds have also similar effect. *Flowers* combined with other articles are used in pickles, or made into confection. Confection prepared thus: Berries are first soaked in water for 12 hours; strain and throw away the water; boil the berries in fresh water for a couple of hours so that they may become soft; then grin them into a paste and add three times their quantity of sugar and make into confection; it is given in doses of 1 to 2 drachms. It is a pleasant purgative, useful in habitual constipation; it is employed by Hakims with much benefit in palpitation of the heart and in various complaints connected with digestive organs, such as biliousness, anorexia or dyspepsia, etc. Other preparations recommended in Ayurveda are: *Dhatri Leha*: Take of powdered emblic myrobalan 64 tolas, prepared iron 32 tolas, liquorice powder 16 tolas, mix them together and soak in the juice of *gulancha* for seven times, successively. This is given in doses of 20 to 40 grains in anaemia, jaundice and dyspepsia. *Dhatri Arista* or fermented liquor of emblic myrobalans: Take fresh juice of two thousand emblic myrobalans, honey in quantity equal to one-eighth of the juice, powdered long pepper 16 tolas, sugar six seers and a quarter; mix them together, boil for a while and leave the mixture to ferment in an earthen jar. This liquor is used in jaundice, lypepsia, indigestion, cough, etc. *Aksirul-ul-Imraz* recommends following mixture for leucorrhoea: Take of *Tukhm Amla* 5 parts and sugar-candy 2 parts. Mix and take for 14 days. An ointment made of the dried emblic myrobalans 4 parts, Camphor 1, Nuxvomica seed 4, Sulphur 4, Copper sulphate 1, Red oxide of mercury, 2 parts and ghee, is a useful application in obstinate itch, prurigo etc. The following recipe has proved successful in curing fever and cough combined: Take of *Lohasavam* 3 *ss*, *Chyavanaprasa* 1 oz., *Asoka ghritam* 1 oz., and Honey 6 ozs., and make into a *Leham*. Give ¼ tola morning and evening before food. *Chyavanaprasa*, an Ayurvedic preparation so familiar among the people is composed of the following drugs: Barks of Aegle marmelos, Premna serratifolra, Bignonia indica, Gmelina arborea, Bignonia suaveolens, roots of Sida cordifolia, Hedyasarum gangeticum, Uraria lagopoides, Phaseolus trilobus, Glycine debilis, piper longum, Tribulus languinosus, Solanum xanthocarpum, Rhus succedanea, Phyllanthus niruri, Grapes, Caelogyne ovalis, Aplotaxis auriculata, Aquilaria agallocha Chebulic myrobalans, Tinospora cordifolia, *Riddhi* (not being obtainable, *Bala* or Sida cordifolia is used), *Jivak, Rishabhaka* (*Bhemi kushmanda* or Bamboo Manna is used), Curcuma zerumbet, tubers of Cyperus rotundus, Boerhavia diffusa, Meda, Withania somnifera; not being obtainable Cassia fistula is used; Elettaria cardamomum, Nemphae stellata, Red sandal wood, convolvulus paniculatus, roots of justicia adhatoda, the root called *Kakoli*, & Leea hirta. Take one *pala* of each of these. Take also 500 fruits of Phyllanthus emblica and tie them loosely in a piece of cloth. Boil all these together in 64 seers of water down to 16 seers and strain the decoction. Throw out the seeds of the myrobalans and taking the remnants of the fruits, fry them in 6 *palas* of ghee and 6 *palas* of sesamum oil mixed together. The fried product is then to be reduced to a paste on curry stone. After this boil the decoction and this paste, with 50 *palas* of sugar candy. When the boiled matter assumes some degree of consistency, throw into it bamboo manna 4 *palas*, powder of Piper longum 2 *palas*, that of the bark of Cinnamomum zeylancium

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2 tolas, that of the leaves of Cinnamomum tamala 2 tolas, that of Cardamoms 2 tolas, and that of the flowers of Mesua ferrea 2 tolas, and stir the contents. When cooled, add 6 palas of ghee and keep the compound in a jar long in use for storing ghee. *Dose:* ½ to 2 tolas, vehicle being goat's milk. This is a nutritive tonic, useful in phthisia, and improves all conditions of debility. The drug is also used in scorpion-sting.

Enicostema littorale
(Family: Gentianaceae)

Vernacular Names

Hind.–Chota-kirayat, Chota-chiretta; *Bom.*–Kada-vinayi, Manucha; *Tam.*–Vallari; *Tel.*–Nela-guli, Nela-gulmidi.

Habitat

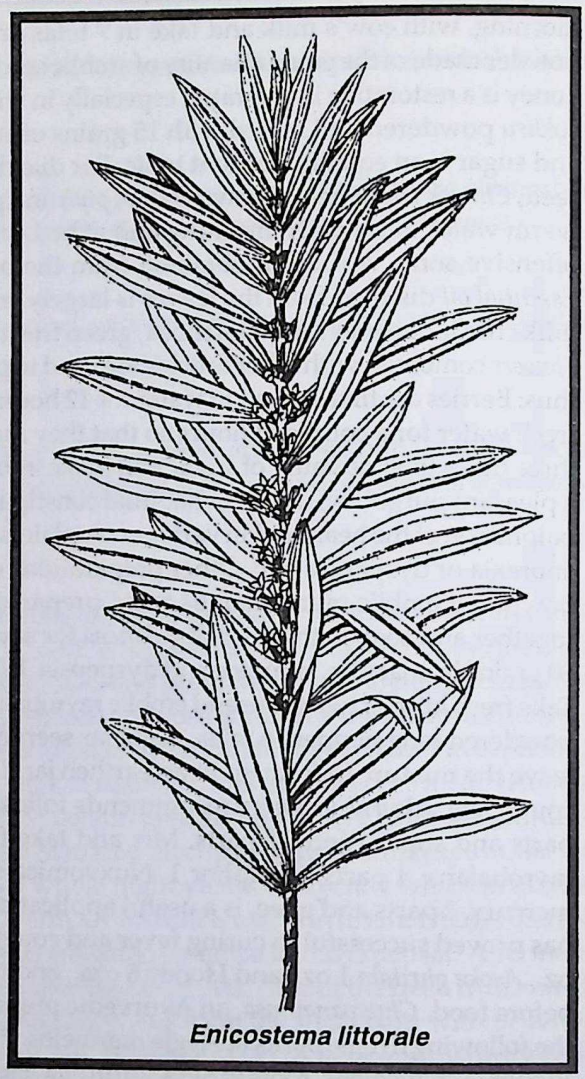
Commonly available in the Punjab and Mumbai bazars.

Constituents

Bitter principle.

Action

Flowering plants are stomachic bitter tonic, laxative and carminative.



Enicostema littorale

Epilobium angustifolium
(Family: Onagraceae)

Vernacular Name

Eng.–Rosebay Willowherb.

Botanical Description

A perennial herb with a creeping rhizome and a tall, erect, usually unbranched leafy stem. The leaves are alternate and lanceolate with entire or slightly toothed and undulate margins. The rose-purple flowers are arranged in a long terminal raceme. The fruit is along, four-valved capsule with many plumed seeds. The flowers are attractive to bees.

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Habitat

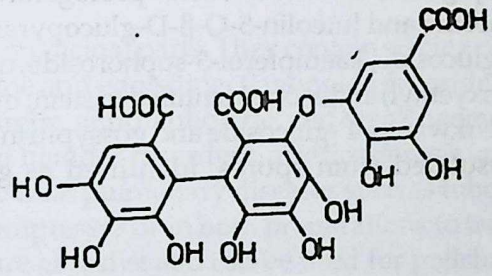
Rosebay Willowherb grows throughout most of Europe in clumps in woodland clearings, on embankments and in waste places. It is a common weed in the British Isles. It thrives on ground that has been cleared by fire, hence one of its alternative common names, Fireweed, and it was one of the first plants to colonize London's bomb sites during the Second World War. In the main common name Willowherb refers to the willow-like form of the leaves. The generic name, *Epilobium*, comes from two Greek words, *epi* (= upon) and lobos (= a pod), and refers to the fact that the flowers stand upon the top of the long, thin fruits, which look rather like the flowerstems. The leaves have been used as a tea substitute and are still taken that way in Russia.

Constituents

Sexangularetin, kaempferol, quercetin and myricetin isolated from fruits and flowers.

Isovalonic acid isolated and characterised.

New Compounds



Isovalonic acid

Uses

Mainly the leaves are used medicinally. Their constituents include tannins (up to 20 per cent), mucilage, sugars, pectin and vitamin C. These substances give Rosebay Willowherb demulcent, astringent and tranquillizing properties. A decoction or infusion is used to treat headache and migraine. Being rich in vitamin C the tea is recommended as a spring tonic. The rhizomes, which contain fewer tannins and no mucilage, are used in a decoction or chewed fresh for stomach disorders, including diarrhoea. The fresh rhizome, and also the fresh leaves and young shoots, can be eaten as a vegetable.

Equisetum arvense
(Family: Equisetaceae)

Vernacular Name

Eng.–Common Horsetail.

Botanical Description

A perennial, non-flowering herb with black rhizomes bearing two kinds of hollow stems with 6–19 grooves, the first in spring, the second in summer. The fertile spring stems are jointed, without chlorophyll and with a compact terminal cone of sporangia; the sterile summer stems are green with

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grooved toothed sheaths at the joints, and branch in whorls. The branches are solid. The sheath teeth have black tips.

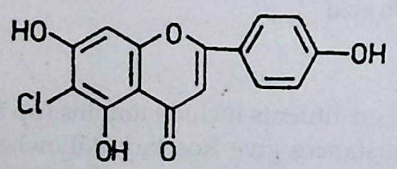
Habitat

Common Horsetail is a common and widespread weed of light sandy soil in fields, by roadsides and on waste ground where it is an indication of the presence of underground water. There are several other species of horsetail native to the British Isles but *E. arvense* is the only one now usually collected for medicinal purposes. It is a popular remedy for circulatory and kidney troubles. Marsh Horsetail (*E. palustre*), with 4–8 grooves on its stems, is common and widespread in damp places. The sheath teeth are blackish with narrow whitish margins. Shady Horsetail (*E. pratrense*) has a more local distribution in northern England and Scotland. The stem has 8–20 grooves and the sheath teeth are brown with blackish tips.

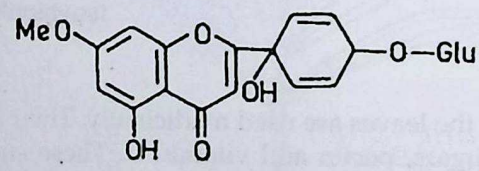
Constituents

Main aglycone of saponin showed haemolytic action. Isoquercitrin isolated from herb; isolation and characterisation of 6-chloroapigenin; a new flavonoid–protogenkwanin-4'-glucoside–isolated; genkwanin-5-O-β-D-glucopyranoside and luteolin-5-O-β-D-glucopyranoside isolated; saponaretin, apigenin-5-glucoside, luteolin-5-glucoside, kaempferol-3-sophoroside, quercetin-3-glucoside, 2,2,5,7-tetramethyl-4-hydroxy-6-(2-hydroxyethyl)-indanone identified in stem; methyl esters of protocatechuic and caffeic acids isolated; protogenkwanin-4'-glucoside and gossypitrin isolated from fertile sprouts; articulatin and isoarticulatin, isolated from spores, identified as gossypitrin and herbacitrin respectively.

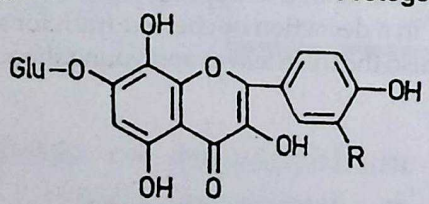
New Compounds



6-chloroapigenin



Protogenkwanin-4'-glucoside



Gossypitrin
R = OH
Herbacitrin
R = H

Herbacetin and 3'-hydroxyherbacetin (gossypetin-3β-D-(2-O-β-D-glucopyranosido-glucopyranoside)-8-β-D-glucopyranoside) isolated from aerial parts together with kaempferol-3-β-D(2-O-β-D-glucopyranosidoglucopyranoside)-7-β-D-glucopyranoside.

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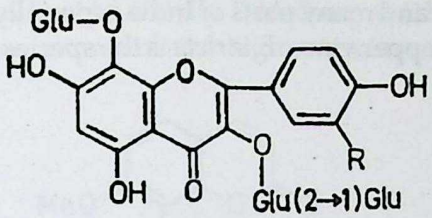
New Compounds



Herbacetin
R = H
3'-hydroxyherbacetin
R = OH

Kaempferol-3-sophoroside-7-glucoside and kaempferol-3-sophoroside isolated.

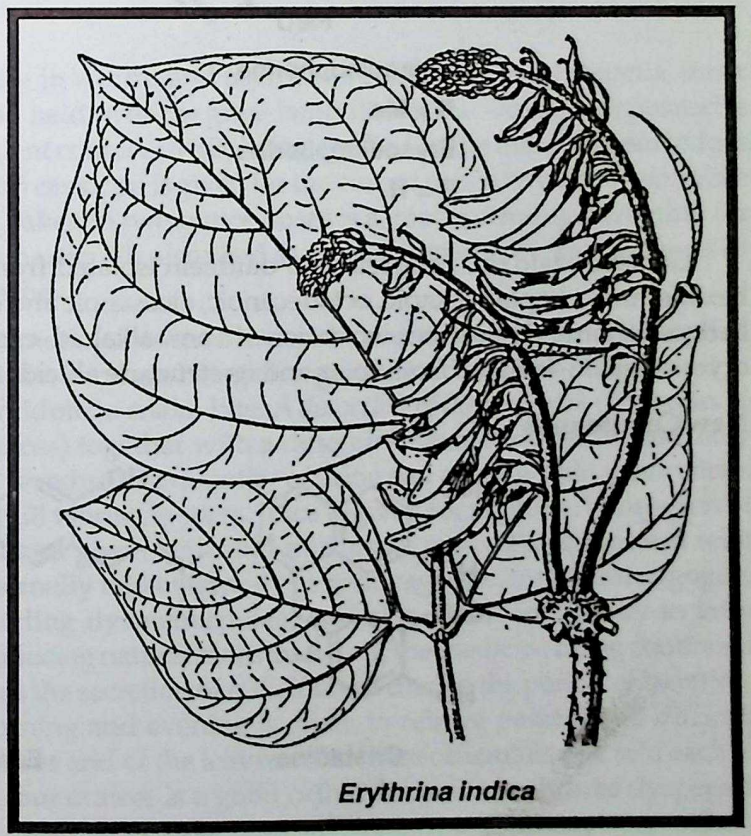
Uses

The green stems are the medicinal parts. They contain silicic acid (more as the plant grows older), traces of the alkoloids nicotine and equisitine, flavonoid glycosides and saponins. These substances give Common Horsetail diuretic, antidiaphoretic, and weak haemostatic properties. It is used in tea mixtures to treat kidney and bladder disorders, arteriosclerosis, and to check internal and external bleeding. It was once used to treat pulmonary diseases such as tuberculosis. It is added to gargles for sore throat and is used in compresses or in bath preparations to treat stubborn wounds, skin rashes and skin ulcers. The stems are abrasive and can be used for polishing and scouring.

Erythrina indica, Lam.
(Family: Papilionaceae)

Vernacular Names

Sans.–Mimbataru, Mandalia, Paribhadra, Parijataka, Palitmandar; *Eng.*–Indian Coral Tree, Moochy Wood Tree; *Fr.*–Arbre immortel; *Ger.*–Indischer korallenbaum; *Hind.*– Ferrud, Mandar, Pangra; *Ben.*–Palita-madar, Palidhar; *Bom.*–Pangaru; *Mah.*–Pangara, Panara, Paringa; *Guj.*–Panarawas, Pararoo; *Tel.*–Barijamu, Machhikara, Modugo, Baridachettu, Badchipa-chettu; *Tam.*–Kaliyana marukka, Badisc; *Mal.*–Mooloomogrikah; *Can.*–Harawana, Warjippe, Hongara, Pongara; *Kon.*–Pangiro.



Erythrina indica

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Habitat

This tree is common in Bengal and many parts of India especially in Southern India often grown in gardens as a support for black-pepper vines. *E. stricta* is the species found in Malabar and used like *E. Indica*.

Parts Used

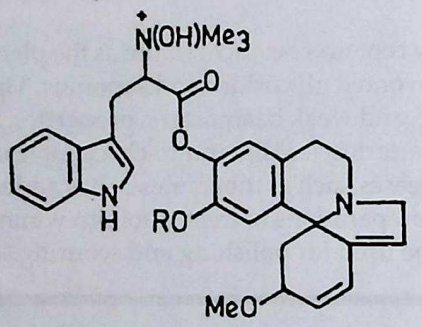
Bark, juice and leaves.

Constituents

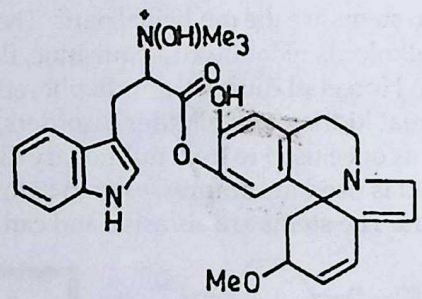
Bark contains two resins and a bitter poisonous alkaloid *erytherine* which exists in the leaves also.

Structure of erysodinophorine; erysopinophorine isolated from pods and its structure determined; isoerysopinophorine isolated from seeds and characterised; synthesis of erysotrine and erythraline.

New Compounds



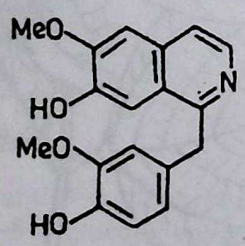
Erysodinophorine
R = Me
Erysodinophorine
R = H



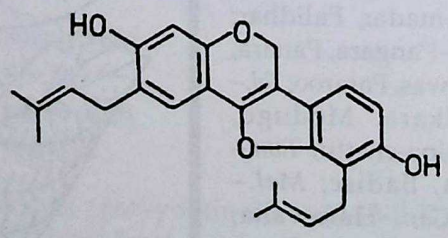
Isoerysopinophorine

Genistin, daidzin, genistein and daidzein isolated from trunk wood and bark; pentadecanoic, hexadecanoic, heptadecanoic, octadecanoic, eicosanoic and docosanoic acids identified only in trunk bark; isolation and structure elucidation of a new alkaloid–cristadine–from leaves; a new pterocarpene–erycristagallin–isolated from roots and its structure elucidated.

New Compounds



Cristadine



Erycristagallin

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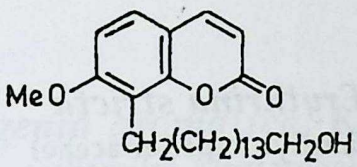
Biological Activity

Erycristagallin showed antimicrobial activity. 7-Methoxy-8-(15-hydroxypentadecyl)coumarin (I), erysovin, erysodine, hypaphorine, sitosterol and stigmasterol from bark.

New Compounds



I

Erythratine, erysopine, erysodine, erysovin along with epi-erythratine and erysoflorinone as minor constituents isolated.

Action

Bark is antibilious, expectorant, and febrifuge; also anthelmintic. It reduces *vayu* and *kapha*. Juice is vermifuge and cathartic. The drug is found to act on the central nervous system so as to diminish or abolish its functions. Leaves are diuretic, laxative, emmenagogue, and galactagogue. *Erytherine* is in action antagonistic to strychnine and may be used as an antidote to strychnine poisoning.

Preparation

Infusion of leaves (1 in 10), dose–2 to 8 drs. Powder and Decoction of bark (1 in 20), dose–2 to 4 drs.

Uses

Bark is used in decoction in dysentery, in worms and useful as a collyrium in ophthalmia. Inner side of the bark is smeared with ghee and held over the ghee-lamp flame; the *soot* thus deposited is used in watery eye, tinea-tarse, and parulent conjunctivitis, being applied to the inner side and edges of the lower lid. *Juice of the leaves* mixed with castor oil is given for the cure of dysentery. *Fresh juice* of the leaves with a few drops of honey added, taken in two ounce doses is a good vermifuge, whether for round, tape or thread worms; it acts as cathartic; it is also used as an injection into the ear for the relief of ear-ache and as an anodyne for toothache.

Crushed leaves are applied hot to rheumatic joints to relieve pain; and as *poultice* they are applied hot and bandaged upon venereal buboes, the bandage being changed twice daily. The drug is used in liver troubles also. It is also used as an antidote to snake-bite. *A decoction of the root-bark* (2 tolas in 16 ounces of water boiled down to four ounces) together with a dose of *Vasanta Kusumaker Rasa* daily every morning in cases of diabetes is said to reduce the quantity of urine and sugar within a short time. *Juice of the bark and young leaves* is used to kill worms in sores. Juice is given for syphilis. *Young-roots* of the white flowered variety are pounded and given with cold milk as an aphrodisiac. Cooked with coconut milk the *fresh leaves* are used internally and externally as galactagogue and emmenagogue; *leaf juice* is said to have cured long-standing dysmenorrhoea, and also removed sterility in fatty women by gradually reducing fat and producing natural menstrual flow, the medicine being continued for two to three months. The juice increases the secretion of milk if taken during the period of lactation. The juice in doses of 3 to 4 drachms morning and evening is given to relieve painful and difficult micturition. A *decoction* made of these leaves and of the leaves of Emblica officinalis one tola each in sixteen ounces of water boiled down to four ounces is a good cathartic useful in chronic dyspepsia

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with constipation. *Leaves* dropped well and mixed with treble the quantity of rice-straw (chopped as well) and given especially to milch cattle as it is, or better still boiled with a little *rice-konda*, is a rich food having high nutritive qualities. The younger the leaves are the better is their food value, and is an unsurpassed stuff for mixing with rice-straw.

Erythrina stricta
(Family: Papilionaceae)

Botanical Description

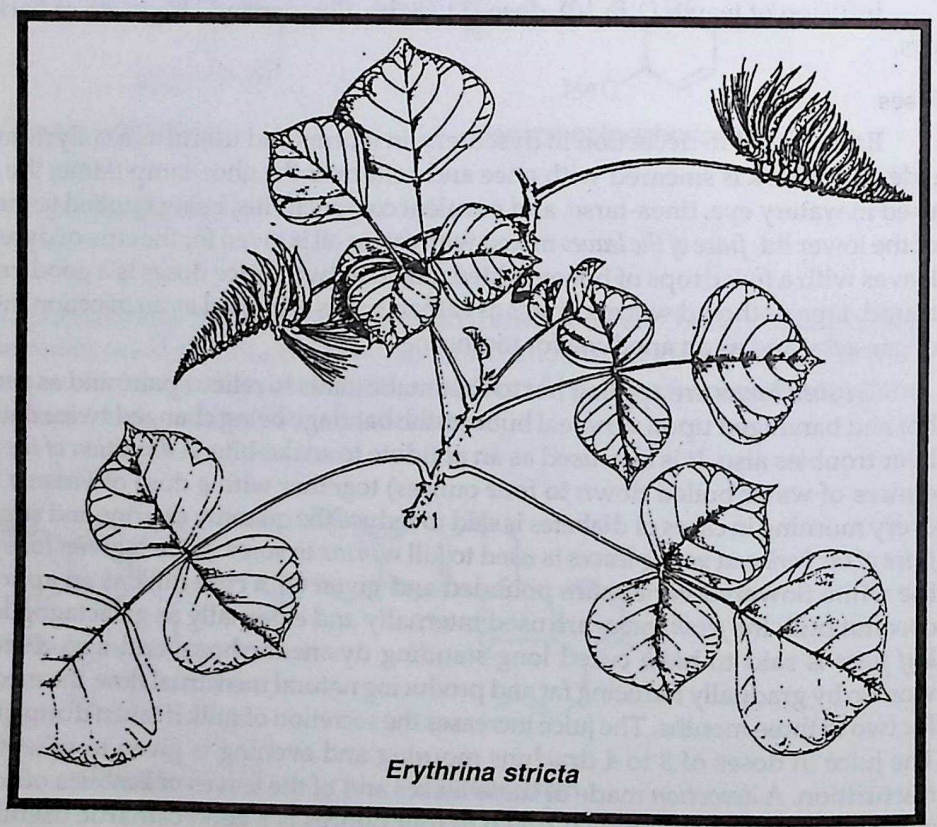
Medium sized deciduous tree, armed with short dense sharp prickles; leaves alternate, pinnately 3-foliolate, stipulate; leaflets broadly deltoid-ovate, 8-12 × 9-20 cms, glabrescent on both surfaces, inequilateral; flowers scarlet-red, crowded in dense terminal unilateral racemes; calyx spathaceous, entire at the tip; corolla papilionaceous; stamens 10, monadelphous; ovary villous containing 4 to 6 ovules; fruit a stalked, linear, 1-3 seeded pod.

Habitat

The plant is found in Assam, Manipur, Chittagong and the West Coast of Kerala and also in Nepal, Burma, Thailand, Vietnam and China.

Uses

Paribhadra is acrid, hot, anthelmintic, carminative, diuretic, galactagogue, expectorant and febrifuge. Bark and leaves are used in medicine. It is used in anorexia, ear diseases, helminthic manifestations, inflammation, intestinal worms and obesity. The drug promotes appetite, destroys pathogenic parasites, arrests excessive micturition, and cures oedema, flatulence, colic, arthritis, skin affections and diseases due to the



Erythrina stricta

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morbidity of *vata* and *kapha*. Decoction of the bark is used in dysentery, ophthalmia and other eye diseases. Fresh juice of the leaves is a good vermifuge. It cures dysmenorrhoea, reduces excess fat and increases secretion of milk. Crushed leaves are applied to rheumatic joints to relieve pain. *Maharajaprasariṇi tailam* and *Vidangamutadi kasayam* are some of the preparations using the drug.

Eugenia aromatica, Kuntze
(Family: Myrtaceae)

Vernacular Names

Sans.–Lavangam; *Hind.*–Laung.

Botanical Description

Eugenia aromatica is a tree reaching a height of 10-15 m, with numerous slender horizontal branches forming a dense pyramidal crown. Bark is pale yellowish grey in colour and smooth. *Leaves* opposite numerous and evergreen, 3-6 inches long. A great profusion of flowers grow in clusters. The *flowers* when gathered are at first of a reddish colour but on drying they assume a deep brown cast.

Historical Aspects

Cloves appear to have been known in China as early as 266 B.C., but are not mentioned in vedic-literature. The mention of this spice in Indian literature goes back to the days of the Ramayana. Charaka also mentions its use as medicine. In the beginning it was valued as an aromatic masticatory, after meals and in rituals, and later on gained wide popularity as a condiment and therapeutic agent. The name Tikshna pushpam and Ruchiram are suggestive of and based on its therapeutic uses as an appetiser and digestive.

Habitat

The clove tree is a native of Malacca islands. The Malaccas, Indonesia, Malaysia and neighbouring areas were the sole areas of clove production till the early modern period. Then its cultivation was encouraged by the European colonists in other islands of the Pacific, Zanzibar, Eastern coast of Africa and in the islands of West Indies. In India it is cultivated in Southern India, mainly Kerala and Coorg.

Parts Used

Dried flower buds.

Pharmacognosy

The dried clove is about 16 mm. long and consists of a calyx tube, which divides above into four pointed spreading sepals, surmounted by a globular bud consisting of 4 petals and enclosing a number of stamens. This spice has a fragrant odour and pungent warm taste. The microscopic features have also been studied.

Phytochemistry

Cloves contain about 14-21 per cent of volatile oil, 10 to 13 per cent of tannin and a crystalline substance, caryophyllene, which is white, odourless and is soluble in ether and boiling alcohol, Capsaicin is also present in cloves.

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The oil of clove is prepared by steam distillation and contain 34 to 95% of phenols, sesquiterpenes and small quantity of esters, ketones and alcohols, Medicinal oil has a phenol content of about 82 to 90%. The oils which have relatively low phenol content are mainly used in pharmacy while the strong oils are used in the manufacture of vanillin.

Ayurvedic Properties

Guna: Laghu, Tikshna, Snigdha. *Rasa*: Katu. *Veerya*: Sheeta. *Vipaka*: Katu. *Dosha*: Kaphapittahara. *Karma*: Deepana, Rochana, Durgandhyanashana.

Pharmacology

Eugenia aromatica has been studied for its antibacterial activity. The oil inhibited tuberculosis at 1:80 dilution. Ethanol extract of clove inhibited the growth of *C. botulinum* at 0.5%. Eugenol and Isoeugenol also inhibited the growth of *C. botulinum*. Ethanol extract of *E. aromatica* had the strongest inhibition on all micro-organisms (Gram negative and positive) tested on agar media at 5000 ppm. Eugenol exhibited marked antifungal activity against 4 mold species using agar diffusion method. Eugenol was also bactericidal at various dilutions. Vermicidal activity has been shown. A formula of 68% $FeSO_4$, 9% clove and 22% licorice suspended in 0.5% carboxymethylcellulose solution when injected in rats, with induced gastric ulcer, healed 55-72% of the ulcerated area. It increased salivary flow. Intra-arterially injected eugenol resulted in a transient increase in blood flow in the injection region. Eugenol increased the capillary permeability of the periodontal region.

Safety

In the doses commonly used no adverse reactions are reported. Clove has been used as aromatic masticatory since the days of Ramayana and now has gained popularity in its wide use as condiment and therapeutic agent. In a recent study, the aqueous suspension and its oil, used in large doses produced oedema, congestion and necrosis. Large doses of eugenol caused pulmonary edema in some dogs when given intravenously and produced rigidity of the hind limb when injected intra-arterially.

Clinical Usage

Certain names of this plant like Tikshna-pushpa, Ruchiram, Girvana Pushpam suggest of its therapeutic uses as an appetiser, digestive cordial and antitussive. Also as freshner of mouth and throat. Lavangadivati and Avipattikarachurna are widely used preparations.

Indications

1. Toothache (Local Aplication)
2. Indigestion/flatulence
3. Nausea
4. Halitosis
5. Hyperacidity

Formulations and Dosage

1. Clove oil: 4-6 drops or locally
2. Lavanga churna: 0.5 to 1.5 gm b.i.d.
3. Lavangadivati: 1.25 mg–3.75 mg–to be chewed s.o.s.
4. Avipattikarachurna: 2 gms t.i.d.

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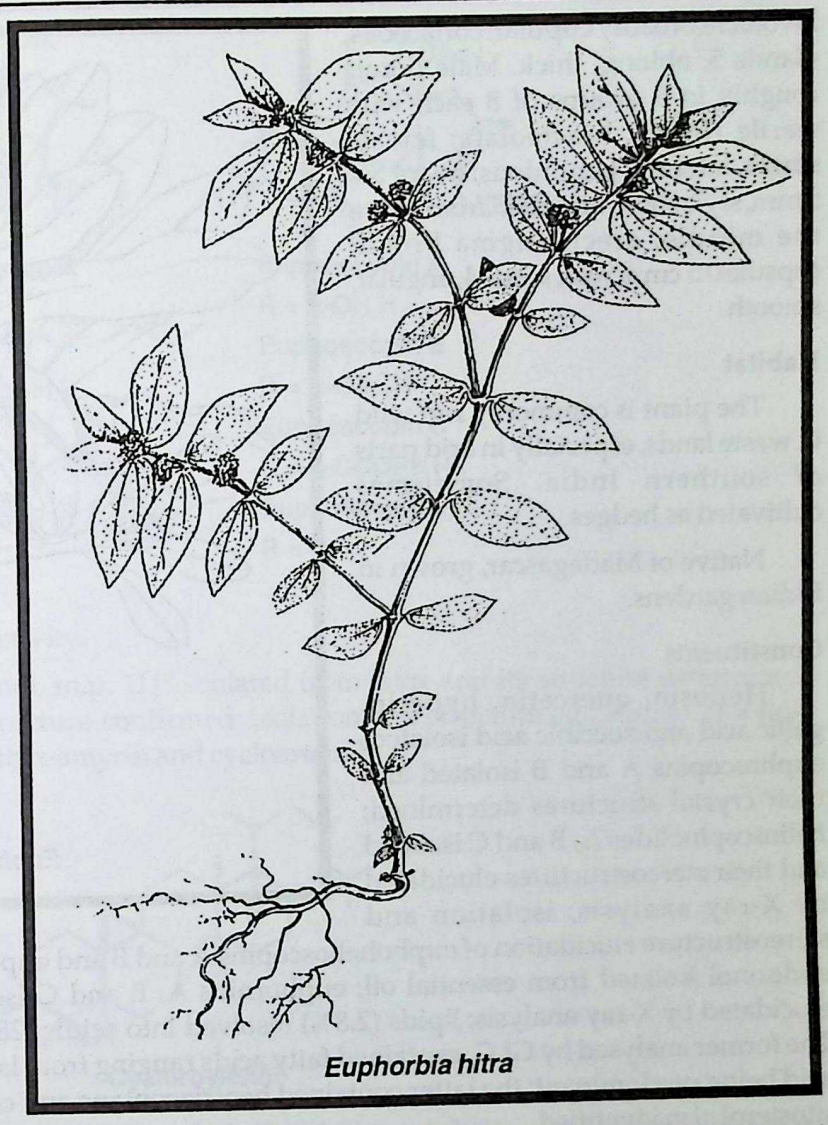
Euphorbia hitra
(Family: Euphorbiaceae)


Euphorbia hitra

Botanical Description

Cyathia in pedunculate, umbellate subsessile axillary clusters, involucre campanulate, 0.7 × 0.6 mm; glands 5, minute, red; male; florets 4-6, ebracteolate; anthers 0.2 mm; female; laterally pendulous; styles 3, bifid from base, stigma obtuse; cpasule pubescent, 2 mm across; seeds 4-angled, minutely furrowed.

Habitat

The plant is a pantropical weed seen in all plains districts especially on roadsides and waste land.

Uses

The plant *dugdhika*, also called *ksira*, *viksirini*, etc. (all including the presene of milky latex in the plant body) is acrid, bitter, hot in action, diuretic and aphrodisiac. It overcomes diseases due to the morbidity of *kapha* and *vata*, purifies blood and cures skin diseases, poisonous affections, cough, asthma and other respiratory disorders. Leaves and seeds are given in bowel complaints of children and worms. The plant juice is a good galactagogue. The whole plant is medicinal.

Euphorbia nivulia, Ham.
(Family: Euphorbiaceae)

Vernacular Names

Sans.–Patta-karie; *Ben.*–Sij; *Bom.*–Newrang; *Tam.*–Akujemudu: Milk is similar to E. neriifolia.

Botanical Description

Armed deciduous trees; branches cylindric with pairs of straight spines inserted on flat corky bases arranged in vertical rows; leaves alternate, subsucculent, oblanceolate-obtuse, base cuneate, upto 28 × 7.5 cm, lateral nerves obscure; cyathia paired in lax cymes in the axils of fallen leaves;

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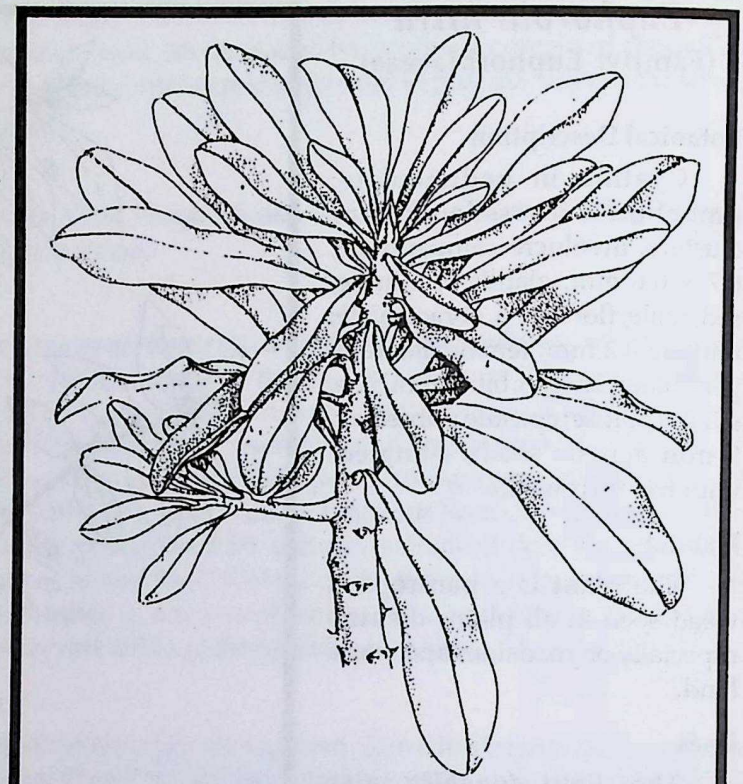
involucre broadly cupular, coriaceous, glands 5, oblong, thick. Male florets roughly in 5 groups of 8 each with sterile florets, bracteolate; female single, laterally pendulous; ovary 3 × 5 mm, style short, branched from above the middle, erect, stigma broad; capsule 0.5 cm across; seeds 4, angular, smooth.



Euphorbia nivulia

Habitat

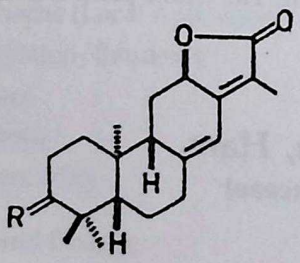
The plant is commonly run wild in waste lands, especially in arid parts of southern India. Sometimes cultivated as hedges.

Native of Madagascar, grown in Indian gardens.

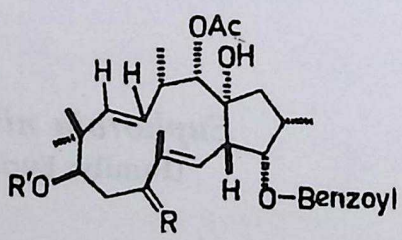
Constituents

Heliosin, quercetin, hyperin, gallic acid and succinic acid isolated; euphoscopins A and B isolated and their crystal structures determined; helioscopinolides A, B and C isolated and their stereostructures elucidated by X-ray analysis; isolation and stereostructure elucidation of euphohelioscopins A and B and euphoscopins C and D; elemol and β-eudesmol isolated from essential oil; euphornins A, B and C isolated and their stereostructures elucidated by X-ray analysis; lipids (2.8%) resolved into acidic (28.7) and neutral (71.1%) fractions. The former analysed by GLC, contained fatty acids ranging from lauric to cerotic acids with palmitic acid being predominant; the latter contained hentriacontane and ceryl alcohol as major products; β-sitosterol also identified.

New Compounds



Helioscopinolide A
R = α-OH, H
Helioscopinolide B
R = β-OH, H
Helioscopinolide C
R = O



Euphornin A
R = α-OH,H, R' = Ac
Euphornin B
R = α-OAc,H, R' = H
Euphornin C
R = O, R' = Ac

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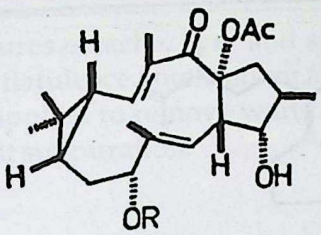
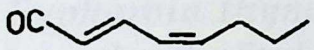
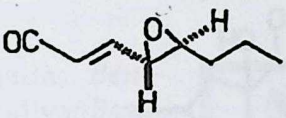
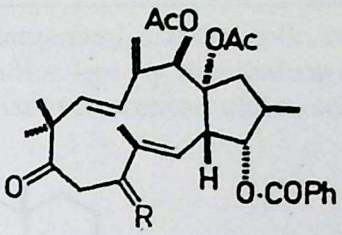


Euphohelioscopin A

R = 

Euphohelioscopin B

R = 



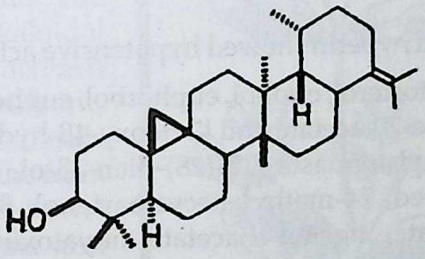
Euphoscopin A
R = α-OH,H
Euphoscopin B
R = α-OAc,H
Euphoscopin C
R = α-OCOPh,H
Euphoscopin D
R = O

Biological Activity

Heliosin showed antitussive activity.

A new triterpenoid–euphorbinol, m.p. 111°–isolated from latex and its structure determined; cycloeuphornol isolated and its structure confirmed; isolation and structure elucidation of a new sterol–euphorbosterol–together with α-amyrin and cycloartenol.

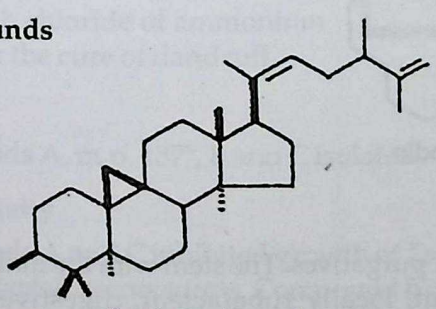
New Compounds



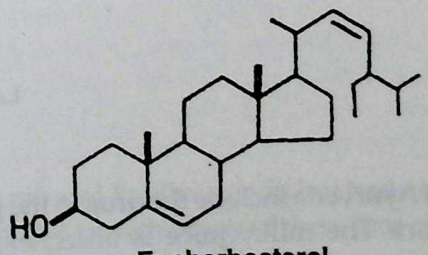
Cycloroylenol

Structure elucidation of cycloroylenol, 24-methylenecycloartenol, β-sitosterol, ingenol triacetate, euphorbol, euphorbol hexacosanoate, 12-deoxy-4β-hydroxyphorbol-13-phenyl-acetate-20-acetate and taraxerone from bark; in addition, n-hexacosanol, cyanidin-3,5-diglucoside, tulipanidin-3-rhamnoglucoside, tinyatoxin, 20-O-acetylresiniferonol-9,13,14-orthophenylacetate, 12-deoxyphorbol-13-isobutyrate-20-acetate, 12-deoxyphorbol-13-O-phenylacetate-16-O-α-methylbutyrate-20-acetate isolated from roots.

New Compounds



Cycloeuphornol



Euphorbosterol

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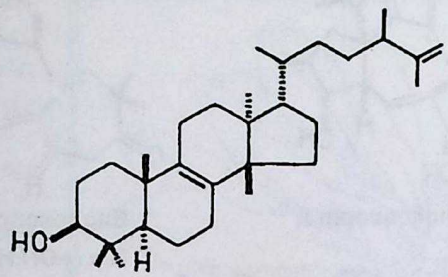
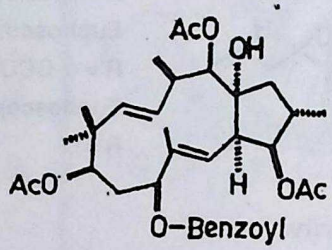


Euphorbinol



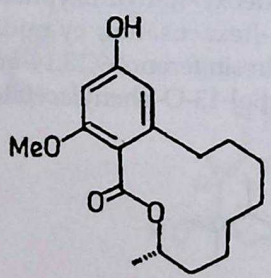
Euphornin

Biological Activity

Kaempferol-4'-O-glucoside and hyperin showed hypotensive activity.

24-Methylenecycloartenol, β-sitosterol, euphol, euphorbol, euphorbol hexacosanoate, l2-deoxy-4β-hydroxyphorbol-13-dodecanoate-20-acetate and l2-deoxy-4β-hydroxyphorbol-13-octenoate-20-acetate isolated from leaves; methylstigmasta-7,24(28)-dien-3β-ol, stigmasta-7,24(28)-dien-3β-ol, β-sitosterol and ellagic acid isolated; 24-methylenecycloartenol, β-sitosterol, β-amyrin acetate, euphorbol, euphorbol hexacosanoate, ingenol triacetate, tinyatoxin and 12-deoxyphorbol-13,20-diacetate isolated from stem; a potent antileukaemic macrolide–lasiodiplodin –isolated and its crystal structure determined.

New Compounds



Lasiodiplodin

Uses

Men of Ayurveda include the drug in the group or purgatives. The stem with the milky latex is the officinal part. The milky juice is bitter, expectorant, locally rubefacient, digestive, stomachic,

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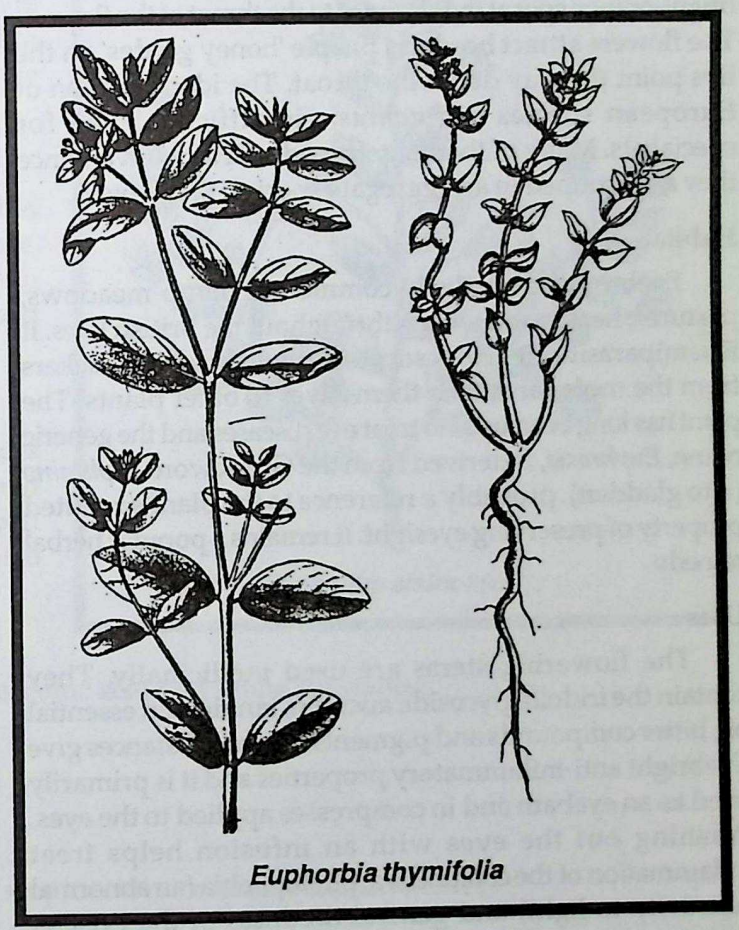
abortifacient and cures earache, liver and spleen enlargement, asthma, colic, cutaneous affections, dropsy, dyspepsia, flatulence, intermittent fever, jaundice, leprosy, rheumatism and insect bites. The juice is externally applied to remove warts and similar excrescences, ulcers, scabies and glandular swellings to prevent suppuration.

Euphorbia thymifolia, Burm.

(Family: Euphorbiaceae)

Vernacular Names

Sans.–Raktavindachada; *Ben.*–Seutkherua, Raktakeru, Dudiya; *Bom.*–Nayeti; *Hind.*–Nigachuni, Chhoti-dudhi; *Punj.*–Dodhak, Hazardana; *Mah.*–Lahannayati; *Tel.*–Peddavari; *Tam.*–Sittra-paladi; *Kon.*–Dudini; *Fr.*–Euphorbe a feuilles de thym.



Euphorbia thymifolia

Habitat

It is found in tropical India. The plant contains a crystalline alkaloidal principle allied to quercetrin. In action it is aromatic astringent, demulcent, stimulant, vermifuge and laxative. Seeds and the small *leaves* are used in the form of *powder* given in butter-milk in bowel complaints of children, worms and gonorrhoea; *root* is given in amenorrhoea; dose is from 5 to 20 grains. It is used also in *decoction* (1 in 40) in doses of 1 to 2 ounces. *Expressed juice* of the *powdered plant* is given with wine as a remedy for bites of venomous reptiles, and applied externally to the bitten part. It is also applied to ring-worm and skin diseases, and mixed with chloride of ammonium it is applied for the cure of dandruff.

Constituents

Compounds A, m.p. 187°, B and C isolated.

Biological Activity

Compounds A and C inhibited growth of *Escherichia coli* and *Bacillus subtilis* but had no effect on *B. cercus* and *Staphylococcus aureus*. Compound B did not inhibit growth of any of these four organisms.

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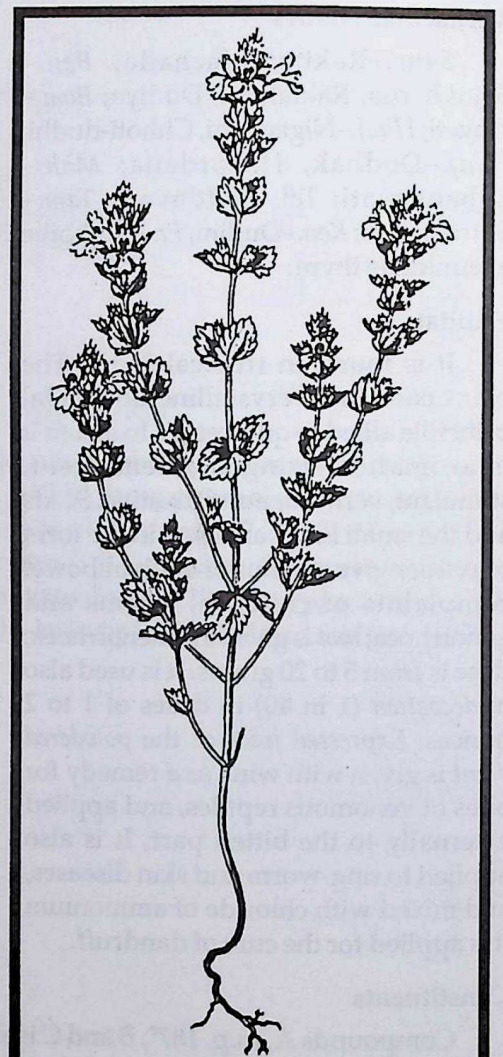
Euphrasia officinalis
(Family: Scrophulariaceae)

Vernacular Name

Eng.–Eye Bright.

Botanical Description

An annual herb with a short, branched, leafy stem. The mainly opposite leaves are small, ovate to lanceolate, toothed and, hairy. The solitary flowers, which grow from the leaf axils, are white, yellowish or tinted violet and have two pronounced lips, the lower one longer than the upper lip and three-lobed. There is a bright-orange spot at the entrance to the throat of the flowers. The flowers attract bees and purple 'honey guides' on the lips point the way down the throat. The identification of European species of *Euphrasia* is difficult, even for specialists. Many of them interbreed and for convenience they are grouped in an aggregate species, *E. officinalis*.



Euphrasia officinalis

Habitat

Eyebright is relatively common in damp meadows, pastures, heaths and woods throughout the British Isles. It is semiparasitic–it grows successfully only where suckers from the roots can attach themselves to other plants. The plant has long been used to treat eye diseases and the generic name, *Euphrasia*, is derived from the Greek word *euphraino* (= to gladden), probably a reference to the plant's reputed property of preserving eyesight. It remains a popular herbal remedy.

Uses

The flowering stems are used medicinally. They contain the iridoid glycoside aucubin, tannins, an essential oil, bitter compounds and pigments. These substances give Eyebright anti-inflammatory properties and it is primarily used as an eyebath and in compresses applied to the eyes. Washing out the eyes with an infusion helps treat inflammation of the conjunctiva, photophobia (an abnormal senstivity to light) and general tiredness of the eyes. A tincture prepared from fresh plant material is used in homeopathy for the same complaints. Internally Eyebright is used as a stomachic. In the past Eyebright was recommended for headache, hysteria and insomnia as well. Poultices of Eyebright are sometimes used to treat stubborn wounds.

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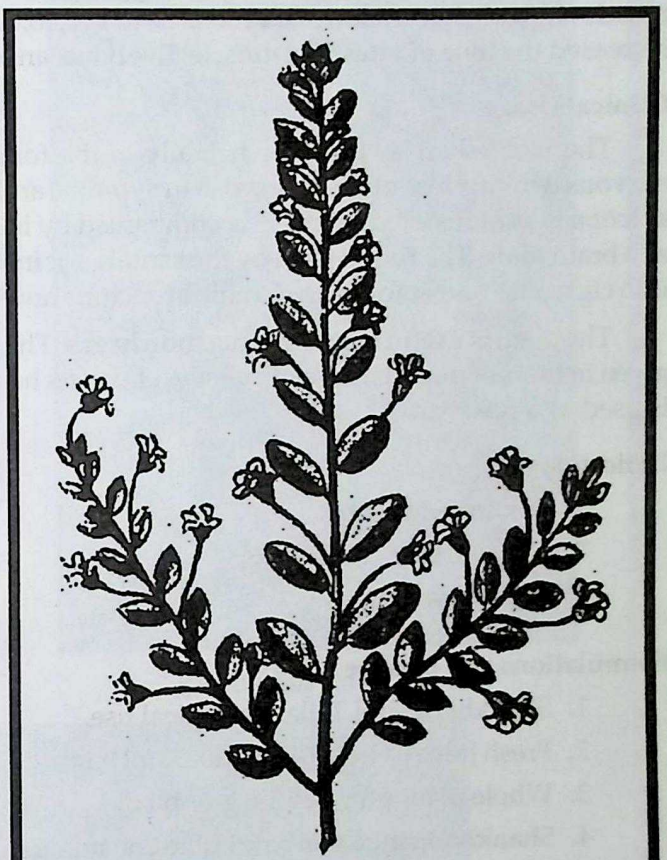
Evolvulus alsinoides, Wall. & Linn.

(Family: Convolvulaceae)



Evolvulus alsinoides

Vernacular Names

Sans.–Vishnukranta, Vishnugandhi; *Hind.*–Shankapushpi; *Mah.*–Shankhavalli; *Kon.*–Shankvel; *Tel., Tam., Can. & Mal.*–Vishnukranti, Vishnukarandi.

Historical Aspects

The term Mangalyapushpi, Supushpi and Mangalyakusuma indicate that the flowers are sacred and are used in worship. Charaka described the specific use to enhance intelligence and improve memory.

Botanical Description

A perennial herb with prostrate branches and small elliptic to oblong, lanceolate, obtuse, mucronate *leaves*, *flowers* mostly solitary in upper axils. Corolla blue rotate and broad funnel shaped, capsule globose.

Habitat

Growing amidst grass in waste places and met with throughout India and Ceylon. It is a common weed growing wildly in open grassy places throughout India. It is also cultivated.

Constituents

A yellow neutral fat, an alkaloid, an organic acid and saline substances.

Parts Used

Whole herb.

Pharmacognosy

The plant has been studied for macroscopic and microscopic characteristics.

Phytochemistry

The plant contains an alkaloid–shankhapushpine. Fresh plant contains volatile oil and potassium chloride. It also contains a yellow neutral fat, an organic acid and saline substances. Three alkaloids–evolvine, betaine, and an unidentified compound have been isolated.

Ayurvedic Properties

Guna: Snigdha, Pichchila, Guru; *Rasa*: Kashaya, Katu, Tikta; *Veerya*: Sheeta; *Vipaka*: Madhura; *Dosha:* Vattapittashamaka; *Karma*: Medhya, Balya, Svarya, Rasayana, Varnya.

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Pharmacology

Fraction 'd' base was shown to decrease the rate and force of contraction in frog heart, in low doses (0.02 mg) while high doses (0.1 mg) causes cardiac arrest. Experiments on rabbit intestinal muscle showed that, in doses of 1 : 500,000 to 1 : 2,50,000 it decreased the amplitude of contraction and increased the tone of intestinal muscle. Evolvine, an alkaloid, has sympathomimetic activity.

Clinical Usage

The whole herb is used medicinally in the form of decoction with cumin and milk in fever, nervous debility, loss of memory, also in syphilis, and scrofula. Decoction of the drug, with *Ocimum sanctum* is administered in fevers accompanied by indigestion or diarrhoea. Shankhapushpi is used as a brain tonic. The root is used by the santals, for intermittent childhood fever. The leaves are made into cigarettes and smoked in chronic bronchitis and asthma.

The plant is useful in internal haemorrhages. The oil promotes the growth of hair. Decoction was given in cases of malarial fever. *Evolvulus alsinoides* has got antidysenteric and antiseptic properties. It is used as a Rasayan.

Indications

1. Nootropic agent.
2. Chronic bronchitis.
3. General weakness.

Formulations and Dosage

1. Shankhapushpi Taila: for topical use.
2. Fresh Juice (whole plant): 20-30 ml b.i.d.
3. Whole plant powder: 3-6 gms b.i.d.
4. Shankhapushpi sharbat: 120 to 250 ml b.i.d.
5. Bramhirasayan: 5-10 ml b.i.d.
6. Medhyarasayan: 5-10 ml b.i.d.
7. Indrarasayan: 5-10 ml b.i.d.
8. Saraswatarishta: 5-10 ml b.i.d.

Action

Tonic, alterative and febrifuge; also anthelmintic and antiphlogistic.

Uses

The whole herb is used medicinally in the form of decoction or infusion (1 in 40) in doses of 2 to 4 ounces. With cumin and milk it is used in fever, nervous debility and loss of memory; also in syphilis, scrofula etc. It is a sovereign remedy in bowel complaints especially dysentery. In fevers attended with diarrhoea or indigestion a decoction of the drug with Ocimum sanctum is administered.

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Eupatorium cannabinum

Euphrasia officinalis

Euphorbia hirta

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Foeniculum vulgare

Fritillaria roylei

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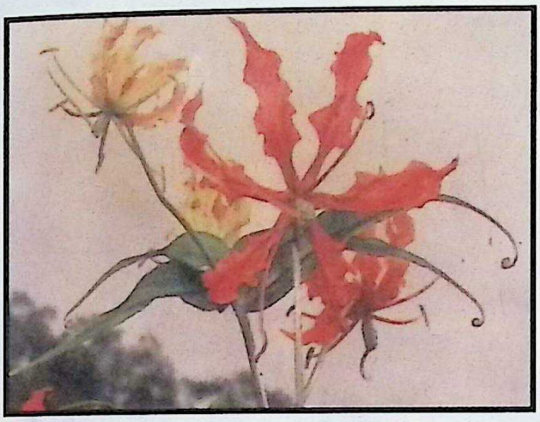
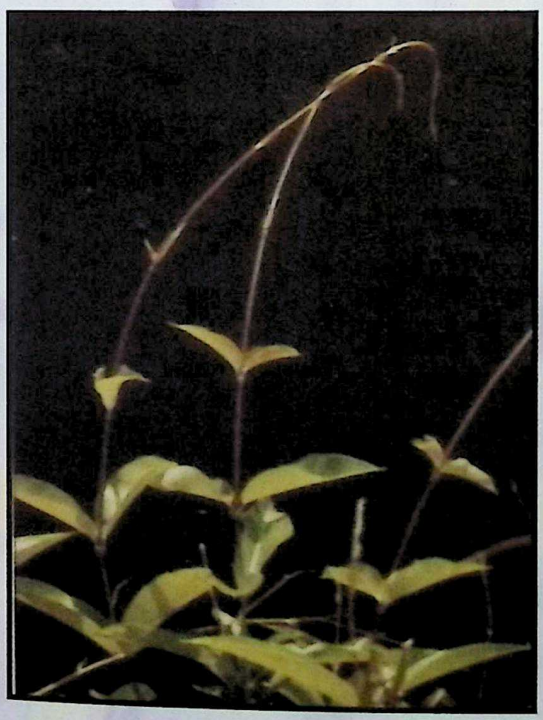


Gloriosa superba

Glycyrrhiza glabra



Hemidesmus indicus

Heracleum candicans

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Holarrhena antidysenterica

Hyoscyamus niger

Inula racemosa

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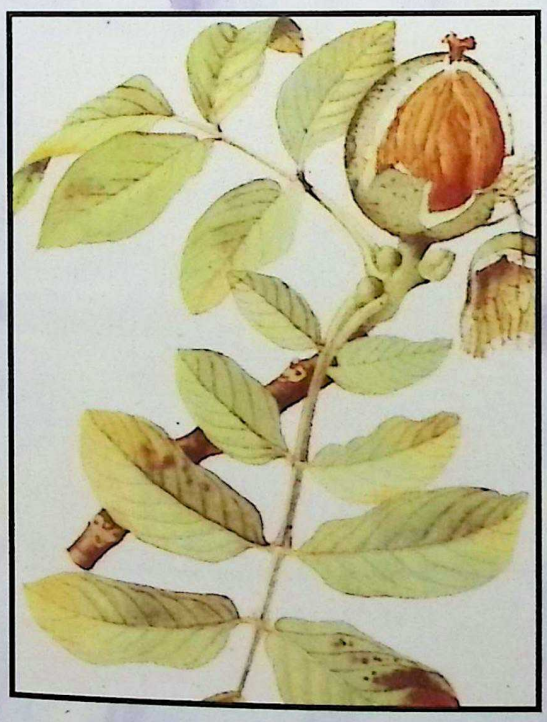
Jasminum multiflorum

Jatropha curcas



Juglans regia

Juniperus macropoda

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Jurinea macrocephala

Justicia adhatoda

Lagotis cashmeriana

Lannea coromandelina

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Lavandula officinalis

Lavatera cashmeriana

Lawsonia inermis

Linum usitatissimum

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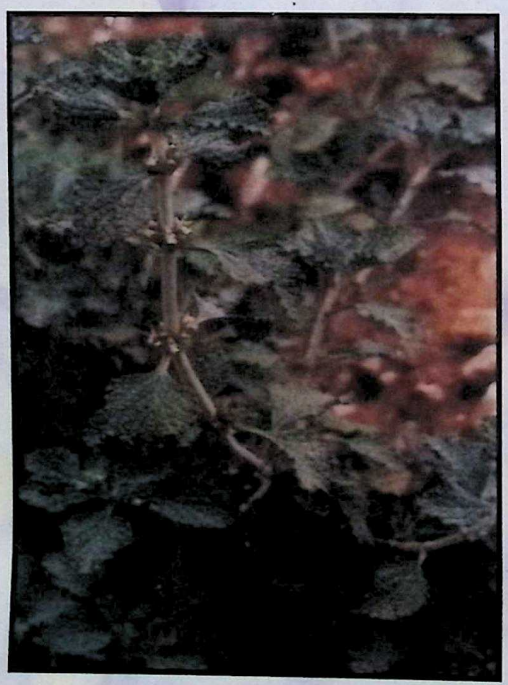
Mallotus philippinensis

Mangifera indica



Marrubium vulgare

Matricaria chamomilla

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Fagopyrum esculentum, Gaertn.

(Family: Polygonaceae)

Vernacular Names

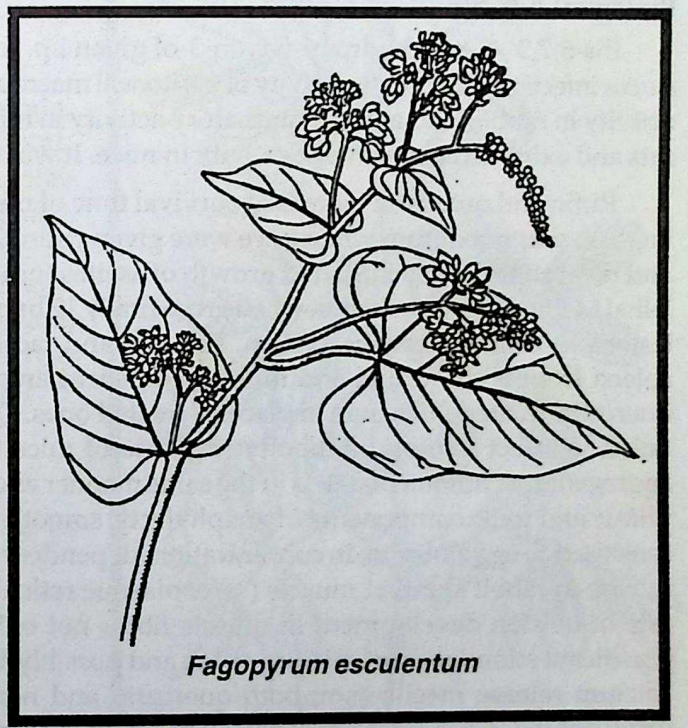
Eng.–Buck-wheat; *Russian.*–Grechevnaya (groats), "Krupa"; *Hind.*–Kaspat; *Mah.*–Kutu.

Botanical Description

An annual herb with an erect, green, hollow and branched stem. The alternate sagittate leaves have undulate margin; the upper ones are sessile, the lower ones stalked. The greenish flowers are arranged in racemes in the axils of the uppermost leaves. The fruit is a rough-surfaced, four-sided achene with wavy, toothed margins.

Habitat

Green Buckwheat is a native of central Asia where it still grows wild; it is also cultivated because it has a short growing period–only 90 days. The seeds are rich in starch and are ground into a tasty flour, which call be used like ordinary flour for making bread and cakes. A closely related species, Buckwheat (*F. esculentum*), was introduced from central Asia to Europe in the Middle Ages. It is widely grown as a source of flour and as fodder for animals. In the British Isles *F. esculentum* is sometimes found as an escape on waste ground. Its stem is usually red, instead of green like Green Buckwheat's, and its fruit is three-sided and smooth. The common name Buckwheat may be a corruption of the Dutch word *boecweite* meaning beech wheat, because the fruit resembles a beechnut. A better explanation might be that the name comes from an old German word *bukweten* (goat's wheat) for a grain that is inferior to true wheat.



Fagopyrum esculentum

It is grown in the Bombay Presidency.

Constituents

Seed contain a good deal of starch.

Plant used for treatment of lung infections; root extract given i.p. to mice exhibited activity against *Staphylococcus aureus* infection; enhanced phagocytic activity of peritoneal macrophages. It also showed antipyretic activity in rabbits.

β-Sitosterol, (C-4→C-8)bis- (5,7,3′,4′-tetrahydroxy-flavan-3-ol (I) and an unidentified compound isolated; hecogenin isolated from bulbs.

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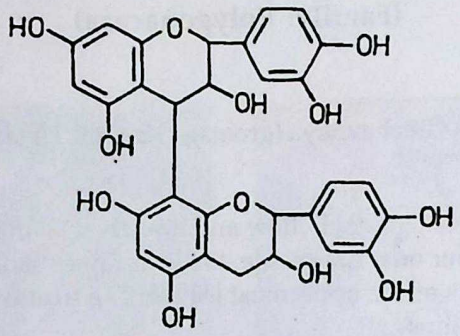
New Compounds



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Biological Activity

Bis-5,7,3',4'-tetrahydroxy-flavan-3-ol given i.p. to mice showed activity against *Staphylococcus aureus* infection. Phagocytic activity of peritoneal macrophages was enhanced. It also showed antipyretic activity in rabbits and anti-inflammatory activity in mice and rats. It inhibited platelet aggregation in rats and exhibited expectorant activity in mice. It was also active against pulmonary sepsis.

Rutin and quercetin increased survival time of mice inoculated with NK/Ly ascites tumor cells; increase was maximum when mice were given rutin (2.0 mg) twice daily for 8 days. Luteolin, morin and pelargonidin also inhibited growth of ascites tumor calls *in vitro*; quercetin protected mice from lethal Meningo virus infection when given orally 12 hr before and upto 56 hr after inoculation. Necrotic lesions in central nervous system, salivary and lacrimal glands, thymus, pancreas, kidneys and spleen from both normal and immuno-deficient animals were less severe and developed later in quercetin-treated mice than in placebo-treated ones. Quercetin enhanced graft-vs.-host reaction, but failed to affect humoral antibody response of mice to sheep red blood cells; quercetin inhibited aggregation of human platelets in the same manner as calmodulin inhibitors; quercetin inhibited both phasic and tonic components of anaphylactic smooth muscle contraction of ileum from guinea pigs sensitised to egg albumin, in concentration–dependent fashion; study of effect of quercetin on calcium release in rabbit skinned muscle (sarcoplasmic reticulum) fibres indicated that quercetin increases rate of tension development in muscle fibres not only by inhibition of calcium influx but also by significant stimulation of calcium efflux and possibly, by increase in Ca^{2+} sensitivity of a Ca^{2+} induced calcium release mechanism; both quercetin and naringenin inhibited the dextransucrase which produces α-1,3-rich (insoluble) glucan to a higher degree than the dextransucrase which forms α-1,6-rich (soluble) glucan, thus, quercetin strongly inhibited adhesive glucan formation by *Streptococcus mutans* on human dental plaque. Naringenin, hesperetin and chrysin showed only partial suppressive effect.

Uses

The nutritive value of buck-wheat is low in comparison with wheat, but is yet sufficiently high to render it of importance as an article of food in several parts of the world. Buck-wheat groats, *i.e.*, the small nuts are a popular food and are prepared very simply by hulling the little nuts, fruits or "grain" of the plant, and grinding the contents. These buck-wheat groats are boiled and converted into porridge, but more commonly are made up into various types of compact cakes and served with soups, and in other ways. Buck-wheat cakes are well-known as one of the special dishes of the USA.

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The discovery of rutin, a substance that affects the strength and permeability of the capillary walls, was of primary importance for the pharmaceutical use of Green Buckwheat because the flowering stems contains up to 1 per cent of rutin, a flavonoid glycoside. The substance is used in proprietary medicines for treating circulatory disorders. Buckwheat has, however, been supplanted as a major source of rutin by Japanese Pagoda Tree (*Sophora japonica*).

Feeding buckwheats to cattle is suitable only if the livestock are not out in the sun. If exposed to sun the animals are subject to fagopyrism, a disease characterized by skin rash, swelling of the head and neck, and spasms.

Feronia elephantum
(Family: Rutaceae)

Feronia elephantum

Vernacular Names

Sans.–Kapitha, Kapi-priya, Dadhi-phala; *Eng.*–Elephant or Wood-apple; *Hind.*–Kavat, Kavitha; *Fr.*–Feronia geant; *Ger.*–Elephantenapfel; *Sind.*–Katori kavath; *Guj.*–Kotha, Kavit; *Duk.*–Katbel, Khaet; *Ben.*–Kathbel; *Burm.*–Mahan; *Mah.*–Kavipana, Kavath; *Santal.*–Kavatha; *Tel.*–Velaga; *Tam.*–Vilakpittam, Nelavilam, Vila, Vilaphalam, Vellil; *Mal.*–Vilav; *Can.*–Baelada-phala, Bilva-phala, Belawala-kai; *Kon.*–Belpatri-phal; *Arab. & Pers.*–Kabita; *Sinh.*–Diwal.

Habitat

Met with throghout India; cultivated for its fruit.

Parts Used

Fruit, gum, leaves, bark, and pulp.

Constituents

Pulp contains a large quantity of citric acid, mucilage and ash containing potash, lime and iron. Leaves yield an essential oil similar to that obtained from leaves of Aegle marmelos.

Two unidentified compounds isolated from bark; feronolide, mp. 115°, form bark; feronone, mp. 195°, from bark.

Biological Activity

Feronolide was a potent depressor of blood pressure and stimulant of gut. It had potent parasympathomimetic properties; feronone showed depressant action on frog heart.

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Methylchavicol and 1,4-dimethoxy-2-allylbenzene identified in essential oil; roots yielded geranyl umbelliferone, bergapten, osthol, isopimpinellin, xanthotoxin, marmesin and marmin.

Action

Fruit is aromatic, acid, antiscorbutic, astringent (when unripe) and refrigerant. Gum from the stem is demulcent. Leaves are aromatic, carminative and astringent.

Uses

Pulp of the ripe fruits, tastes like coagulated milk and is eaten with sugar; it is useful in salivation; sorethroat and other affections of the gums and throat; in the form of *sherbat* or *chutney* made with the addition of salt, tamarind and spices like *sunth*, black pepper etc., it is useful in hiccup, dyspepsia, biliousness, throat affections etc. *Pulp with honey* and *pipli* is given for hiccup and difficulty of breathing. A *jelly* much resembling black-currant jelly but with a more astringent taste is made from the pulp. Pulp is also useful externally as an application to bites of venomous insects and reptiles; the *powdered rind* may be also used. *Unripe fruit* is employed alone or in combination with Aegle marmelos and other medicine in diarrhoea and dysentery. Fruit when green is made into *chutnies*. Transparent *gummy substance* exuding from the stem when cut or broken resembling gum arabic, may be used in bowel affections and to relieve tenesmus; reduced to powder and mixed with honey it is given in dysentery and diarrhoea. Wood-apple is eaten as diet in convalescence after diarrhoea. *Young leaves* have a fragrant smell like anisi and their *juice* mixed with milk or with curds and sugar-candy is given in biliousness and the juice is externally applied to the skin eruptions caused by biliousness. *Bark* is prescribed in *powder* or *decoction* for biliousness. Under the name of *Pancha Kapitha, i.e.*, the five products of Faronia a medicine is prepared which contains the flowers, roots, leaves, bark and fruit. *A medicated oil* is also made of the five parts of the plant which is used for applying to the whole body. A compound powder krown as *Kapithaashtaka churna* is recommended in *Sarangadhara*, which is used in doses of one drachm in chronic diarrhoea, dysentery with loss of appetite and in affections of the throat. It is given in sweetened milk or mixed with honey. It is prepared thus: Take of the pulp of unripe wood-apples eight parts, sugar six parts, pomegranate juice, tamarind pulp, *bela* fruit, flowers of Woodfordia floribunda, *ajmoda* and long-pepper each three pacts, black-pepper, cumin seeds, coriander, long-pepper root, root of Pavonia odorata. *sonchal* salt *ajowan*, cardamoms, cinnamon, *tejapatra*, flowers of Mesua ferrea, ginger and plumbago root, each one part; powder the ingredients finely and mix. Other preparations are fluid extract, *dose*: ½ to 1 drachm and syrup of the fruit, *dose*:- ¼ to ½ ounce, useful in dyspepsia, in quenching the thirst of fevers and in scorbutic conditions.

Ficus bengalensis, Linn.

(Family: Moraceae)

Vernacular Names

Sans.–Vata; *Hind.*–Vad.

Botanical Description

A very large tree, 20-30 m high with *aerial roots*. *Leaves* ovate, coriaceous with scale-stipules. *Flowers* minute, unisexual. Male flowers near the month of receptacle and female flowers with shorter perianth. The *fruits* are round and red with innumerable tiny seeds.

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Historical Aspects

The name banyan was given to the tree growing in the Persian Gulf under which some 'banyas'–Hindu traders had built a pagoda. To the Hindus it is sacred and worshipped with special prayers on Vata Savitri day. A very large vata tree near Narmada is famous in India and is called Kabirvad. Charaka refers to the medicinal properties of the tree, due to Kashayativa.

Habitat

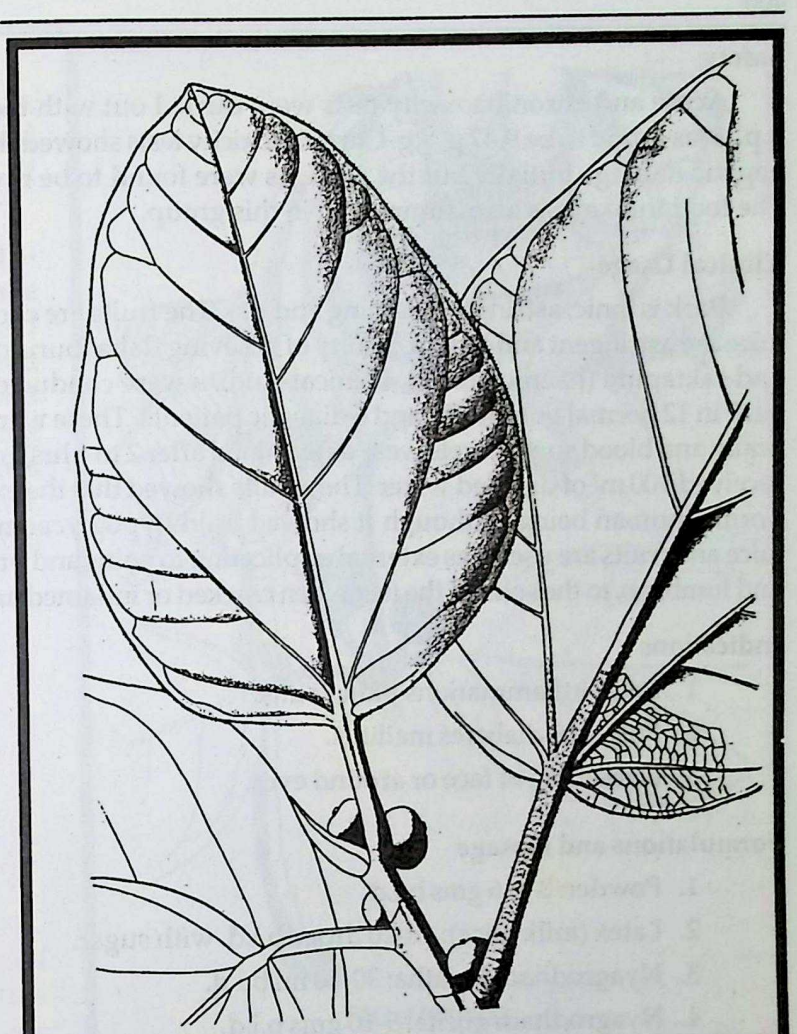
This is well known tree found throughout India and is planted around temples and in gardens.

Parts Used

Latex, bark, fruits, leaves, roots and root bark, buds, bark, aerial roots.

Pharmacognosy

The outer surface of bark shows hard crusty layer, greenish black colour and transverse wrinkles. The bark structure resembles some characters of the tree *F. racemosa*. The microscopic features have been well-studied.



Ficus bengalensis

Phytochemistry

A hypoglycaemic principle was isolated from the bark. It is a glycoside with m.p. 160° soluble in alcohol and water. A triterpine, friedelin and β-sitosterol were isolated from the leaves. The tigilic acid ester of α-taraxasterol was isolated from the heart wood. The flavonols of the leaves were identified as quercetin-3-galactoside and rutin.

Ayurvedic Properties

Guna: Guru, Ruksha; *Rasa*: Kashaya; *Veerya*: Sheeta; *Vipaka*: Katu; *Dosha*: Kaphapittahara; *Karma*: Grahi, Stambhana, Raktapittaghna, Varnya, Yonidoshuta, Garbhada, Dahaghna, Mutrasangrahaniya Atisaraghna.

Pharmacology

The tannins and flavonoids relieve capillary bleeding. The latex has bactericidal action.

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Safety

Acute and chronic toxicity tests were carried out with the aqueous extract in mice. Acute LD_{50} (i.p.) was found to be 9.47 g/kg. Chronic toxicity tests showed that the extract in higher dose produced hepatic damage initially but the changes were found to be reversible on continued administration. The food intake was also diminished in this group.

Clinical Usage

Bark is tonic, astringent, cooling and dry. The fruits are cooling and tonic. Young buds and milky juice are astringent and have a quality of relieving daha (burning), trishna (thirst), murchha (fainting) and raktapitta (haemorrhage). Clinical studies were conducted with crude aqueous extracts of the bark in 12 normal volunteers and 6 diabetic patients. These were given 100 ml of 10% aqueous extract orally and blood sugar levels were determined after 2 to 4 hrs, respectively. A control group of persons received 100 ml of distilled water. The results showed that the extract had no hypoglycaemic action on normal human beings although it showed mild hypoglycaemic activity in diabetic patients. Milky juice and fruits are useful as external application to pains and bruises, sores and ulcers, in rheumatism and lumbago, to the soles of the feet when cracked or inflamed and to the teeth and gums for toothache.

Indications

1. Local inflammations-skin, joints.
2. Polyuria, diabetes mellitus.
3. Darkening of face or around eyes.

Formulations and Dosage

1. Powder: 3 to 6 gms b.i.d.
2. Latex (milk juice): 10-20 drops b.i.d. with sugar.
3. Nyagrodhadi kwatha: 30-60 ml b.i.d.
4. Nyagrodhadi ghrita: 5-10 gms b.i.d.

Ficus hispida, Linn. & F. daemona

(Family: Urticaceae)

Vernacular Names

Sans.–Kakadumbura, Ummettodumbara; *Ben.*–Kakoudumbar, Kakadumur; *Hind.*–Katgular, Konea-dumbar; *Guj.*–Janglian Jir, Dhed-Umbro; *Bom.*–Rambal; *Mah.*–Vede umde, Kharwat; *Tam.*–Pe-allippayam, Kattu-Atthi, Pe-Atthi, Pe-Attiss, Pechi, Pethi; *Tel.*–Verse atti-pandhlu, Adavi-atthi, Kukka-bodda; *Can.*–Adavi-atti; *Kon.*–Vadli kharwant.

Habitat

Found in Bengal, Coromandal Coast, and South India.

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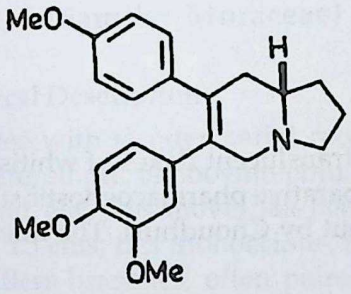
Constituents

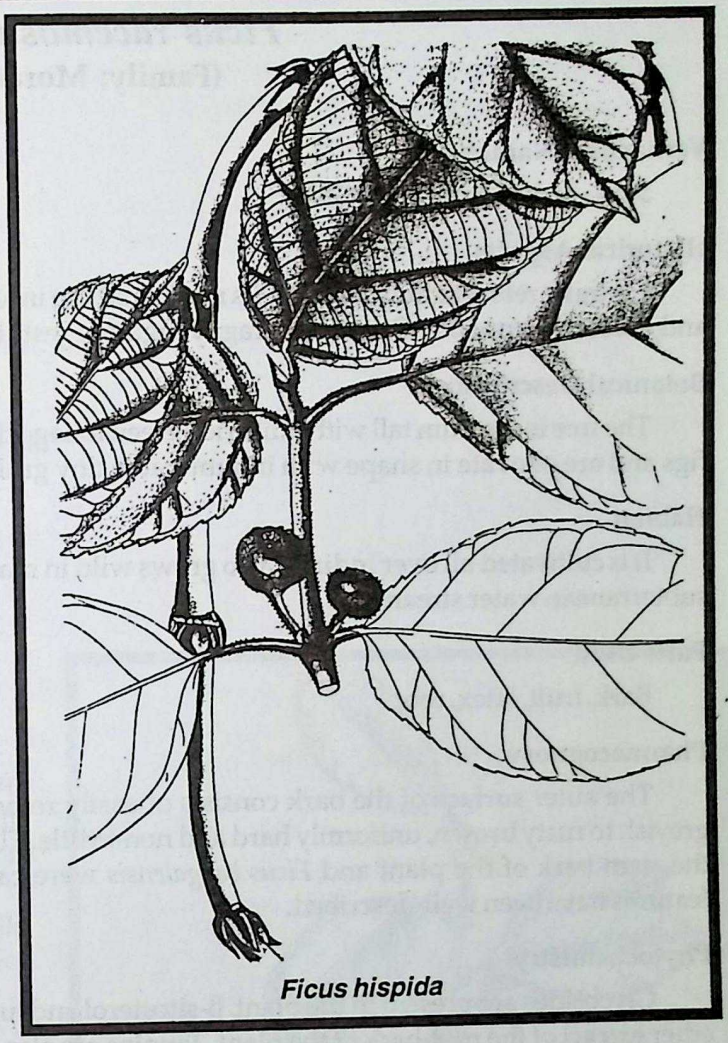
Its constituents are tannin, wax, a caouthouc-like substance and a glucosidal principle having the properties of saponin.

Bergapten, psoralen, β-amyrin and β-sitosterol isolated; GLC of surface hydrocarbons from fresh leaves showed expected preponderance of odd numbered (C25-33) alkanes which comprised 50.58% of total alkanes; hispidine along with known phenanthraindolizidines isolated and characterised; n-triacontanyl, β-amyrin and gluanol acetates isolated from bark.

New Compounds



Hispidine



Ficus hispida

Parts Used

Bark and fruit. Balk is emetic and laxative. *Nighantus* describe the fruit as cooling, astringent and sour. In *powder* or *decoction* (1 in 10) it is given in hepatic obstruction. Dose of the powder is 40 to 60 grains, and of the decoction half to one ounce. Fruits and seeds in a dose of 15 to 30 grains of bark, 3 to 4 times a day; acts as antiperiodic. A *poultice of the bark* is applied to buboes to disperse them or to bring them to maturity. Per internal administration *seeds* of the ripe fruit dried and preserved from moisture in stoppered bottles are given in 1 drachm doses, which is equal to 4 to 6 of the ripe fruits. Figs of this plant, promote the secretion of milk: and preserve the foetus in the womb. *Nighantus* say that the various parts of this tree are effective in cases of *Kusta, Vrana, Kapha, Pitt, Piles,* Jaundice and *Pandu,* and healer of wounds. In the treatment of *Switra* (.....) *Charat* advises that the juice can be taken with jaggery as a *Sramsana. Bhavaprakasa* says that a mixture of honey and the juice of fruits, proves a good anti-haemarrhagic. Powders of Hingu, the root of *Kapi-kachu* (.....) with the juice of these fruits, used as snuff is said to be a curative of *vatavyadhi* by *vangasena.* Root is said to cure poisons of *Sarameya*.....in which, it has been advised that it should be taken in the form of a powder with the fruits of *Dhatura* and rice-water, and is also applied as a poultice in buboes. Many uses are similar to Bengalensis.

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Ficus racemosa, Linn.

(Family: Moraceae)

Vernacular Names

Sans.–Udumbar; *Hind.*–Gular.

Historical Aspects

Charaka refers to the plant and its medicinal use in Mahakashaya and prescribes it for heartburn and excessive appetite. One name, Yagnyanga suggests the use of the plant in ritual sacrifice.

Botanical Description

The tree is medium tall with quite rich green foliage that provides good shade. The *fruits* resemble figs and are obovate in shape with innumerable tiny grain-like seeds.

Habitat

It is cultivated all over India. It also grows wild in many forests and hills. It is often found around subterranean water streams.

Parts Used

Bark, fruit, latex, root.

Pharmacognosy

The outer surface of the bark consists of easily removable translucent flakes of whitish tissue, greyish to rusty brown, uniformly hard and non-brittle. The comparative pharmacognostic studies on the stem bark of the plant and *Ficus bengalensis* were carried out by Choudhuri. The microscopic features have been well-described.

Phytochemistry

Glycosides are present in the plant. β-sitosterol and lupeol have been isolated from the petroleum ether extract of the root-bark of the plant. Tannins are also present. Psoralens have also been detected.

Ayurvedic Properties

Guna: Guru, Ruksha; *Rasa*: Kashaya, Madhura; *Veerya*: Sheeta; *Vipaka*: Katu; *Dosha*: Kaphapittahara; *Karma*: Mutrasangrahaniya, Varnya, Atisaraghna, Stambhaka, Shothahara, Bhagnasandhanakara, Vranashodhana.

Pharmacology

The alcoholic extract of the stem bark of the plant possessed antiprotozoal activity against *Entamoeba histolytica*.

Safety

In clinical practice no adverse reactions have been reported.

Clinical Usage

It is astringent, carminative, vermifuge and an anti-dysentery drug. It is a good remedy for excessive appetite. The extract of fruit is used in diabetes, leucoderma and menorrhagia. It is used locally to relieve inflammation of skin wounds, lymphadenitis, in sprains and fibrositis.

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Indications

1. Excessive appetite
2. External burning
3. Skin inflammation
4. Diarrhoea/Dysentery
5. Leucoderma.

Formulations and Dosage

1. Powder: 1.5 to 3 gms. b.i.d.
2. Decoction: 30 to 60 ml. b.i.d.
3. Latex: 10 to 20 drops in topical use.

Ficus microcarpa, Linn.
(Family: Moraceae)

Botanical Description

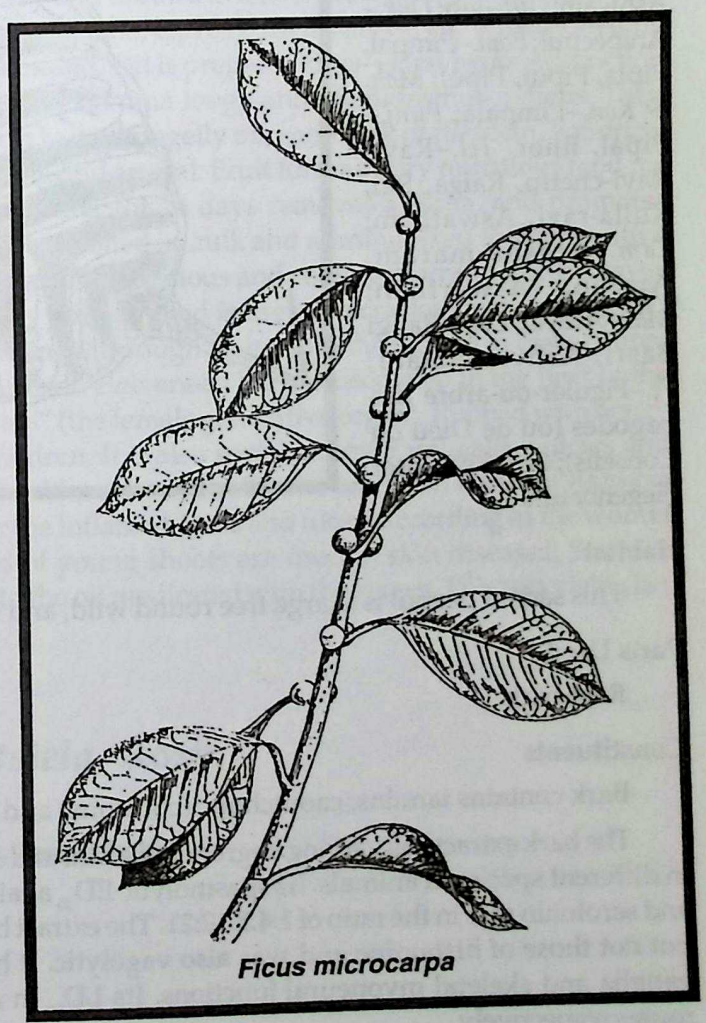
Tree with slender aerial roots; leaves alternate, elliptic or obovate-obtuse, basally 3-nerved, glabrous above, pale beneath upto 12.5 × 5.5 cms; figs monoecious, axillary or on leafless branches, often paired, sessile, globose 0.7–1 cm across, orange-red when ripe; achenes smooth.

Habitat

Widely distributed throughout India in all districts from sea level to about 4,000 ft and also in Sri Lanka, S. China, Ryuku Isls and New Britain.

Uses

Plakash is one of the five ingredients of the group *pancavalkala i.e.* five barks, the decoction of which is extensively used to clear ulcers and as a douche in leucorrhoea and other vaginal diseases. In scabies affecting children, this decoction is administered externally and internally with satisfactory results. *Plaksah* is acclaimed as cooling, astringent and curative of *raktapitta dosas*, ulcers, skin diseases, burning



Ficus microcarpa

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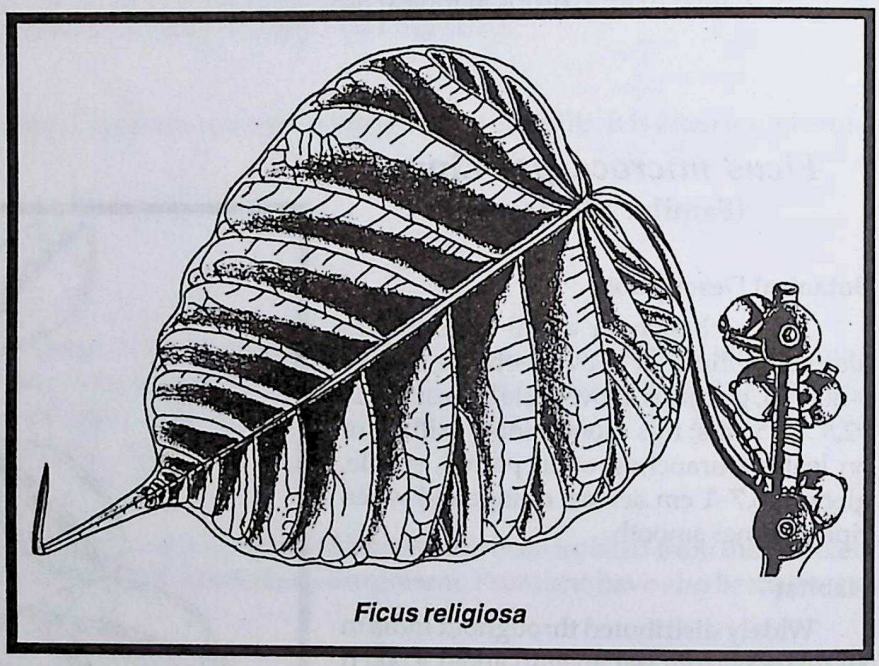
sensation, inflammation and oedema. It is found to have good healing property and is used in preparation of oils and ointments for external application in the treatment of ulcers. The stem bark is used to prepare *Usirasavam, Gandhatailam, Nalpamaradi tailam, Dinesavalyadi kulambu, Parantyadi tailam, Valiya marmagulika* etc.

Ficus religiosa, Linn.

(Family: Urticaceae)

Vernacular Names

Sans.–Pippala, Shreevraksha, Sevya, Aswatha; *Eng.*–Sacred Fig, Peepul Tree; *Hind.*–Pipal; *Ben.*–Asud, Ashwath; *Guj.*–Jari; *Duk.*–Anipeepul; *Bom.*–Pimpal, Pipla, Pipur, Pipul; *Mah. & Kon.*–Pimpala; *Punj.*–Pipal, Bhor; *Tel.*–Ravi; Ravi-chettu, Raiga, Rai, Kulla-ravi, Aswatham; *Tam.*–Arasha-maram, Arasan, Aswarthan; *Mal.*–Areyal; *Can.*–Rangi Basri, Ashvathamara; *Fr.*–Figuier-ou-arbre des pagodes (ou de Dieu ou Conseils); *Ger.*–Religioser Fiegenbaum.



Ficus religiosa

Habitat

This sacred peepul is a large tree round wild, and cultivated all over India by the Hindus.

Parts Used

Root-bark.

Constituents

Bark contains tannins, caoutchouc (cochtone) and wax.

The bark extract has varying degree of relaxant and spasmolytic effects on various smooth muscles in different species of animals. Its spasmolytic ED_{50} against acetylcholine, histamine, barium chloride and serotonin was in the ratio of 1:4.5:12:21. The extract blocked cardiovascular effects of acetylcholine but not those of histamine and was also vagolytic. It has no antiacetylcholine action at autonomic ganglia and skeletal myoneural junctions. Its LD_{50} in rats was 2.24 and 0.80 g/kg by oral and i.v. routes respectively.

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β-Sitosterol-D-glucoside injected i.v. into rabbits at 5.0 and 7.5 mg/kg, decreased blood sugar by 23.2 and 33.86% respectively. It produced CNS stimulation, convulsions and reversal of reserpine depression in mice at toxic doses (40-400 mg/kg); LD_{50} was 62 mg/kg, i.p. in mice.

Action

Seeds are cooling, laxative, refrigerant and alterative; leaves and young shoots are purgative; bark is cooling, astringent, sweet has maturative powers and also a corrective of *Kapha* and *Pitta*. Fruit is laxative and digestive. Infusion of bark is astringent.

Uses

Seeds are prescribed in the form of electuary and powder. *Bark* is useful in gonorrhoea and *Vata Rakta*, ulcers, various skin diseases and scabies in *infusion* or *decoction* (simple kashayam) with a little honey (Charaka & Sushruta). Water in which the freshly burnt ashes of the bark have been steeped is said to cure obstinate cases of hiccup and stop vomiting sensation. Milk boiled with dried bark is a good aphrodisiac (Sushruta). A decoction (or oil ?) of the barks if the five varieties of figs, (F. religiosa, F. bengalensis, F. glomerata, F. infectoria (Tjakela) and the root-bark of the *Neem* form *Pancha Valkala* or five barks) called *Pancha Valkala Kashaya* is used as a garle in salivation, as a for ulcers and as an astringent in injecting into the rectum in dysentery and urethra in leucorrhoea. For *external application* in skin diseases caused by vitiated blood such as eczema, leprosy, rheumatism, etc. a medicated oil called *Pancha Valkaladi Tailum* is highly recommended. Oil is prepared thus—First make a decoction (*Kalkam*) of the barks of the five varieties of figs, Curcuma longa and Hemidesmus indicus. Then prepare an oil in the usual way with the addition to it of gingelly oil, root-bark of plantain, liquorice, cinnamon bark, cuscus grass, Aplotaxis auriculata and sandal. Fruit forms a very nutritious food for cattle. Fruit dried and powdered and taken in water for 14 days removes asthma, and promotes fruitfulness in women-(Bartholomes). *Tender shoots* boiled in milk and administered together with a sufficient quantity of sugar added to taste make a very nutritious and cooling morning drink. Leaves and young shoots are used as a purgative. Milky juice applied is useful in cracked feet and cracked skin. Hakims use *powder of the dried bark* by blowing it through a pipe into the rectum in cases of anal fistula and inflammatory swellings as an absorbent. Pulverised bark is used also in the heat of the blood (*Rakta Daha*) and in the diseases of the "*Yoni*" (the female generative organ). Rubbed with honey the powder is applied to aphthous sores of children. It is also sprinkled over unhealthy ulcers and wounds to promote granulations. *Leaves* are a food for silkworms. Tender and fresh leaves of *Asavatha* may be used along with ghee or tailam to cover the inflamed areas and ulcers according as the wound requires *Samana* or *Sodhana* treatment. Leaves of young shoots are used in skin diseases; *Sushruta* attributes the quality of curing pain in the ears to the oil medicated with the leaves. This tree yields lac.

Ficus tsiela, Roxb.

Vernacular Names

Sans.–Kancenica; *Hind.*–Jar; *Bom.*–Pimpri; *Tam.*–Ichchi.

Uses

Used in colic.

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Illness : **Jaundice**
Part used : Bark
Preparation : 3" × 3" piece of bark is crushed, soaked for 10 minutes in 2 cups of water, which is then strained.
Dosage : 1 cup of infusion is taken in the morning and evening for 7 days.
Illness : **Mentally deranged**
Part used : Fruit
Dosage : Half a cup of fruit is to be eaten in the morning and evening.
Illness : **Uncontrolled bleeding**
Part used : Latex
Use : The latex is applied on the wound after cleaning.

Filipendula ulmaria
(Family: Rosaceae)

Vernacular Name

Eng.–Meadowsweet.

Botanical Description

A perennial herb with a short, pink rhizome and a tough, erect, branched and leafy stem. The stem leaves are alternate, odd-pinnate, doubly serrate, dark green above and usually white-felted below; the stipules are broadly cordate and conspicuous. The small, creamy-white, fragrant flowers are arranged in a terminal corymb. The flowers have reflexed hairy sepals and numerous long stamens. The fruit, a one-seeded follicle, is spirally twisted. The scent of the leaves is quite different from that of the flowers.

Habitat

Meadowsweet is common in damp woods and meadows, in fens and by river sides throughout Europe, including the British Isles. The common name, Meadowsweet, is said to be derived from the Anglo-Saxon word *medu* (= mead) because the plant was once used to flavour the drink made from fermented honey. It has been used as a medicinal plant since ancient times and it remains popular as a herbal remedy. It was in the flowerheads that salicylic acid was first discovered in 1839. It was from this substance that aspirin (acetylsalicylic acid) was later synthesized.

Uses

The flowers, and sometimes the young leaves and rhizomes, are used medicinally. All parts contain the glycosides gaultherin und spiraein, traces of alkaloid (heliotropine), tannins, a yellow pigment, vanillin and free salicylic acid, produced by the splitting of gaultherin and citric acid. These substances give the plant anti-pyretic, weak antispasmodic, astringent and antirheumatic properties.

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The flowers are used in an infusion to treat influenza and to alleviate headache and rheumatic and arthritic pain. Meadowsweet is gentler on the stomach than aspirin and it is one of the most effective herbal remedies for gastritis and peptic ulcers. Both the leaves and flowers are also strongly diuretic and are used to treat certain bladder and kidney disorders. The fresh root is used in homeopathic preparations.

Flacourtia indica
(Family: Flacourtiaceae)

Botanical Description

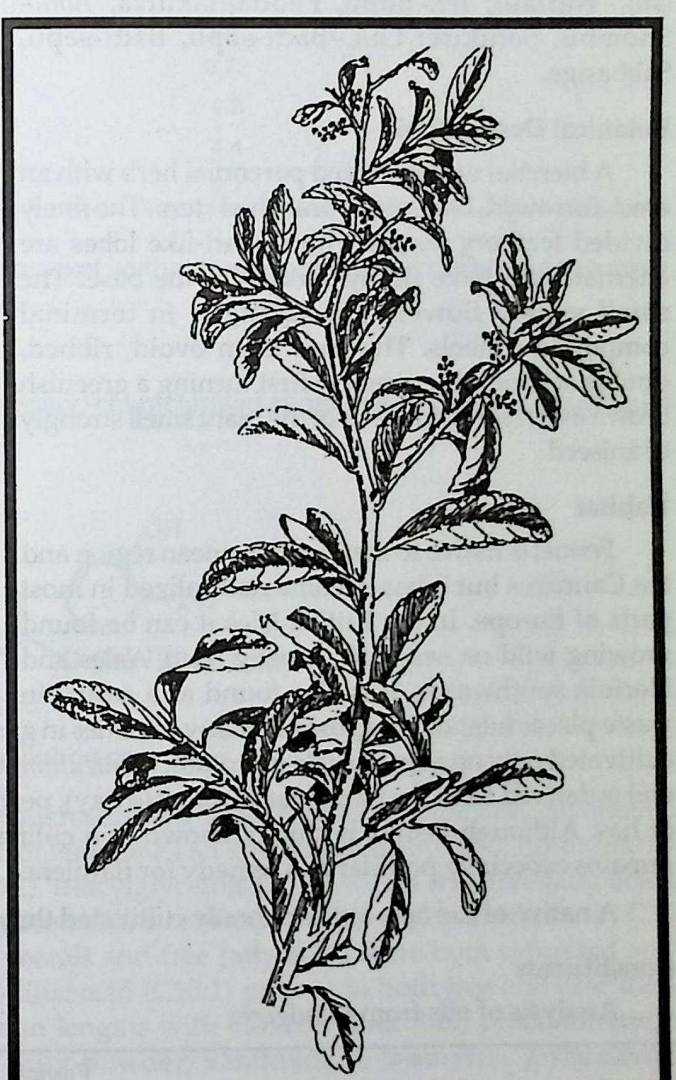
Shrub or small tree with short, spiniferous branches; leaves (sub) opposite or alternate, obovate, obtuse 2.5–4 × 1.5–2.5 cms, coriaceous, glabrous, base attenuate, margin entire; flowers unisexual, clustered on spiniform branchlets, sepals 4 or 5, basally connate, ovate, ciliate; petals O; stamens in male many, unequal; ovary in female 3-celled with 2 ovules in each, styles 3, stout, stigma 3-fid; drupes globose, to 4 mm; seeds obovoid, 3-5.

Habitat

The plant is found in the scrub jungles in all districts in southern India especially on rocky hillocks. Also reported from Africa, Southeast Asia, Polynesia and Malaysia.

Uses

There is no mention about this drug in any of the classic Ayurvedic literature. But Kerala physicians use it in preparations like *Nirgundyadi gulika* and *Nirgundyadi ghrtam*. The root is the officinal part. It is reported to be sweet, cooling, depurative diuretic and is useful in bilious affections, rheumatism, poisonous bites, skin diseases urinary disorders and mental diseases. Fruit is used in cases of jaundice and enlarged spleen.



Flacourtia indica

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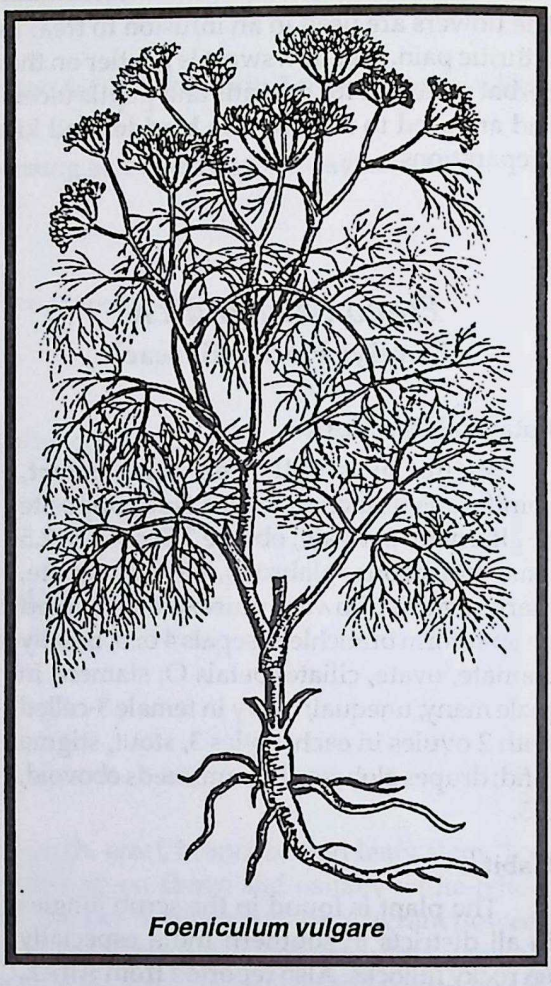
Foeniculum vulgare, Gaertn.

(Family: Umbelliferae)



Foeniculum vulgare

Vernacular Names

Sans.–Madhurika, Methica; *Eng.*–Indian Sweet Fennel, Fennel; *Bom. & Hind.*–Badi or Bari saunf, Sonp, Sont, Badishep; *Bom.*–Barisopha; *Mad.*–Badi-shep, Shepu; *Sind.*–Saunf; *Ben.*–Panmouri, Methi, Mauri; *Guj.*–Warialli; *Tel.*–Sopu, Peddajilakurra; *Tam.*–Shombu, Sohikire; *Can.*–Badi-sopu, Badi-sepu, Sabbasige.

Botanical Description

A biennial or short-lived perennial herb with an erect, furrowed, blue-green branched stem. The finely divided feathery leaves with thread-like lobes are alternate and have fleshy sheaths at the base. The small yellow flowers are arranged in terminal compound umbels. The fruit is an ovoid, ribbed, double achene, blue green at first turning a greenish brown as it ripens. All parts of the plant smell strongly of aniseed.

Habitat

Fennel is native to the Mediterranean region and the Caucasus but it has become naturalized in most parts of Europe. In the British Isles it can be found growing wild on sea cliffs, mostly from Wales and Norfolk southwards. It is also found as a casual in waste places inland. It is grown in many varieties in gardens and as a field crop, but it is commercially cultivated only on a small scale in Britain. *Foeniculum* was the name given to this plant by the Romans and is derived from the Latin word *foenum* (= hay), perhaps because the smell of Fennel resembles that of hay. Although Fennel is chiefly known as a culinary herb it also has several medicinal uses; it remains especially popular as a remedy for flatulence. It is widely used by the food industry.

A native of Europe, but commonly cultivated throughout India.

Constituents

Analysis of oils from *F. vulgare*:

	French Oil	*Galician Oil*	*Russian Oil*	*Indian Oil*
Specific Gravity at 15°C	0.976	0.966	0.967	0.968
Optical rotation in 100 mm. tube	+16°	+22°	+23°	+21°
Melting point after solidification	12.5°	4.0°	4.4°	8.2°
Percentage of fenchone		19.3	18.2	6.7

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The yield of oil obtained is very variable, according to the fruit distilled. In general it averages from 4 to 6 per cent. The yield of the Indian oil was stated to be about 3 per cent. Recently, Sao, Sudborough and Watson studied the oil obtained from F. panmorium, and have found the yield to be 0.72 per cent on an average. This yield is rather low in comparison to the other varieties as well as seen from the table below:

Fennel Fruits

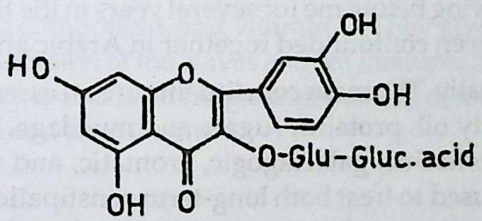
	Variety	*Percentage of Oil*
1.	French Sweet	2.1
2.	German (Saxson)	4.7
3.	Indian	0.72
4.	Russian	4.8
5.	Galician	4.4
6.	Japanese	2.7

Pure anethole has also been placed on the market so that the importance of the oil has to a great extent gone into the background.

Constituents

Nelumboside, m.p. 174°, isolated from leaves and characterized as quercetin-3-glucoglucuronide; anethole detected in essential oil from fruits.

New Compounds



Nelumboside

Acid hydrolysis of fruit extract yielded quercetin; anethole, fenchone, α-pinene, dipentene, anisaldehyde, feniculin isolated; identification of fenchone and anethole in oil by GLC; lipids (9.0%) of seeds contained anethole, hydrocarbons (0.2), triacylglycerols (77.3), waxes (tr.), free fatty acids (2.0), free alcohols (0.1) and sterols (0.3%). Hydrocarbons consisted of C27-C33 paraffins with C30 predominating; acid components of triacylglycerols and free fatty acids were both saturated and unsaturated in the range C14:0-C18:3; petroselinic acid (C18:1) present in both free and esterified forms. Free alcohols comprised of C24-30 chain lengths with C26 (ceryl alcohol) predominating; pharmacognosy of fennel fruit and fennel drug powder; xanthotoxin, α-amyrin, β-sitosterol, imperatorin, bergapten and marmesin isolated from fruits; bergapten, columbianetin, osthenol, psoralen, scoparone, seselin, vanillin, β-sitosterol and stigmasterol identified in fruits; anisoxide, isolated earlier, shown to be artifact probably formed by rearrangement of feniculin during prolonged fractionation of oil; fenchone synthesised; α-pinene, β-pinene, myrcene, limonene, p-cymene and anisaldehyde as minor components (10.0%) whereas fenchone, estragole and anethole as major components identified in seeds and flower oil by GC-MS.

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Uses

Dried ripe fruit and its essential oil are used as stimulant, aromatic, carmlinative, diuretic, emmenagogue and purgative. *Root* is regarded as purgative and it is one of the five purgative roots of the ancients in Europe. The five roots are: Fennel, Parsley Wild Celery, Asparagus and Butcher's Broom (Ruocus aculatus). Leaves, which are used as a vegetable, are diuretic increasing the secretion of urine and perspiration. Fennel *fruit* (seeds) is used as a spice and condiment, and eaten with betel, and as a romatic adjunct to medicines. In Europe it is used in the manufacture of cordials and enters into the composition of fennel water which is employed medicinally, mostly as a vehicle for other drugs and as a flavouring agent. Fennel fruit yields about 3 to 5 p.c. of volatile oil of a pleasant aromatic odour, which consists of anethole or anise camphor and variable proportions of a liquid isomeric with oil of turpentine and small quantities of other substances like fenchone are also present in certain varieties. Anethole is obtainable from fennel in two forms—the solid and the liquid; 7.25 p.c. of ash is found in the fruit. *Juice of the fennel fruits* is used to improve eyesight. *Fennel Water* (Aqua Foeniculi) is given in colic and flatulence of children. *A hot infusion* of the fruit is useful in amenorrhoea and in cases where the lacteal secretion is suppressed, and to produce free sweating. *Oil* is useful in flatulence and checks the gripping of purgatives. *A paste* of the seeds or fruits is used in a cooling drink in fevers and in the scalding of urine. Dose of the seeds is ½ drachm; of the oil–5 to 10 minims. Following preparations are popular as home remedies–(1) Take of F. vulgare 5, sugar 6, tamrind bark 4 and cloves 2 parts. Mix and make a powder; *dose*: 10 to 20 grains, used in chronic skin diseases, (2) Take of F. vulgare 5, *Trikatu* 4, Soupha (another variety of F. vulgare) 2 and Anise seeds 2 parts. Mix and make a powder; dose–1 to 3 drachms. Used in feverishness and indigestion with vomiting. Roxburgh alluding to the Indian variety of fennel says "the seeds possess warmish, very sweet taste and aromatic smell so much like sweet fennel that I should have certainly thought them but varieties of the same species if I had not had both growing before me for several years in the Botanical Gardens at Calcutta." This plant and anise have also been confounded together in Arabic and Persian works.

The fruits are used medicinally. The main constituents are an essential oil (up to 6 per cent) with anethole and fenchone, plus fatty oil, proteins, sugars and mucilage. These substances give Fennel antispasmodic, carminative, stomachic, galactagogic, aromatic, and weak diuretic properties. Tea mixtures containing Fennel are used to treat both long-term constipation and diarrhoea, to allay colic pain, to stimulate milk flow in nursing mothers, to treat urinary disorders and coughs and bronchitis. The essential oil, obtained by steam distillation from crushed ripe fruits, is used in tinctures as a gargle and eyewash and in carminative preparations.

The young fresh leaves are excellent for flavouring food, especially fish, and the roots and swollen leaf bases can be eaten as a vegetable.

Fragaria vesca
(Family: Rosaceae)

Vernacular Name

Eng.–Wild Strawberry.

Botanical Description

A perennial herb with a short rhizome, a rosette of trifoliate basal leaves and long stolons rooting at the nodes. The leaves are long-stalked, bright-green above, white-felted below. The white flowers are

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arranged in a terminal loose raceme. The fruits are achenes spread over the surface of the fleshy, juicy, usually red receptacle–the familiar tasty strawberry. The sepals usually curve backwards away from the ripe fruit.

Habitat

Wild Strawberry grows throughout Europe including the British Isles in woods, scrub, grassland and hedgerows, especially on lime-rich soils. The Alpine Strawberry (*F. vesca* var. *semperflorens*) is a form of this species that grows northwards from the Alps. Another species of northern temperate regions, Hautbois Strawberry (*F. moschata*), produces the most aromatic fruit of all strawberries. The familiar Garden Strawberry (*F. ananassa*), originated from a cross between two American species. In this large cultivated form the achenes are sunk in the flesh of the receptacle. The name Strawberry seems to have no connection with the habit of placing straw under the cultivated plants to keep the berries free of dirt and slugs. Instead it is probably derived from the Anglo-Saxon word *streauberige*, and may refer to the tangled appearance of the runners or to the scattering of pips (achenes) on the fruit, 'straw' in this context meaning 'strew'. The leaves of all wild species of strawberry have been, and still are, used in herbalism. Those of Garden Strawberry, however, do not have medicinal action.

Constituents

Naturally-occurring cyclic imino acid–pipecolic acid–accumulated in leaves when plant was sprayed with maleic anhydride solution which is a growth inhibitor.

d-Catechin, quercetin, kaempferol, cyanidin and leucocyanidin from leaves.

Uses

The dried leaves have a bitter taste and are aromatic. Among their constituents are tannins, an essential oil with a lemon-scented component, and vitamin C. They give Wild Strawberry astringent, diuretic and tonic properties. An infusion of the leaves and tea mixtures benefit sufferers from anaemia and nervousness. Wild Strawberry is also used for gastrointestinal disorders and kidney and urinary diseases. Fermented leaves serve as a tea substitute.

Fraxinus excelsior
(Family: Oleaceae)

Vernacular Name

Eng.–Ash.

Botanical Description

A large deciduous tree with greyish-green bark and terminal black buds from which panicles of small reddish-brown flowers grow in early spring. The flowers produce abundant pollen. The leaves, which appear after the flowers, are odd-pinnate with lanceolate to ovate, finely serrate leaflets. The fruit is a slightly twisted samara (key) with a terminal wing. The keys hang from the twigs in bunches; they are at first green and then brown.

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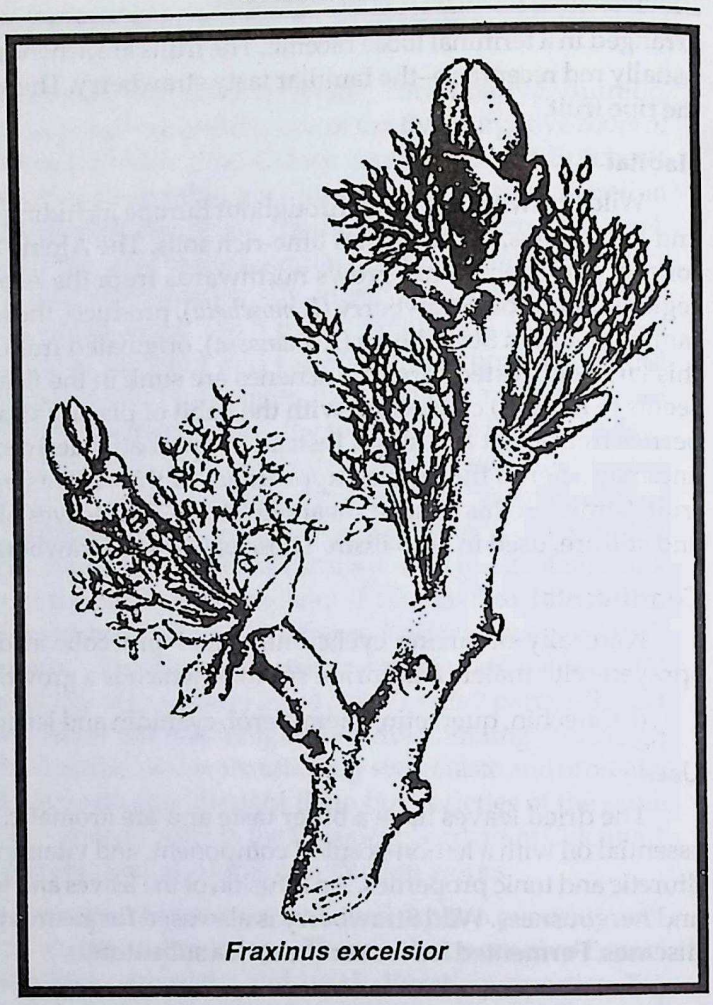
Habitat

Ash grows throughout the British Isles. It forms woods on lime-rich soils, especially in wetter parts. It is less common on acid soils. It produces a hard, pale wood which is well suited for making tools and furniture. The generic name, *Fraxinus*, is the original Latin word for the tree. The common name, Ash, is a corruption of the Anglo-Saxon word *easc* for the tree, but it has an older origin. The medicinal properties of Ash bark have long been known; it was used to treat fever and as a substitute for quinine obtained from Peruvian Bark (*Cinchona succirubra*) and other *Cinchona* species.



Fraxinus excelsior

Uses

The bark and leaves are used medicinally. The bark contains the coumarin glycoside fraxin, tannins and bitter compounds. The leaves also contain fraxin and tannins and also the sugar alcohol mannite and organic acids. Both parts are mildly laxative and diuretic. An infusion is used in herbalism to regulate bowel movements, to expel intestinal parasites, to reduce fever, to treat kidney and urinary infections, to expel uroliths and to alleviate rheumatic and gouty pains. Externally the leaves are used in compresses or in bath preparations to treat suppurating wounds.

Fumaria officinalis, Linn.

(Family: Fumariaceae)

Vernacular Names

Sans.–Khsetra parpati, Yavana parpata; *Eng.*–Common fumitory; *Hind. & Gwalior.*–Pitpapara; *Pushtu.*–Shahtara, Pitapra, Papra; *Beng.*–Shotara, Pit-papra, Ban-sulpha; *Pers.*–Shahtarah, Shatra; *Arab.*–Bukslat-ul-mulik, Baglatul-mulk; *Kash.*–Shahterah; *Guj.*–Pittapapdo; *Bom.*–Pitpapra, Shatra, Pitpapda; *Tam.*–Turu, Tura; *Tel.*–Chata-rashi.

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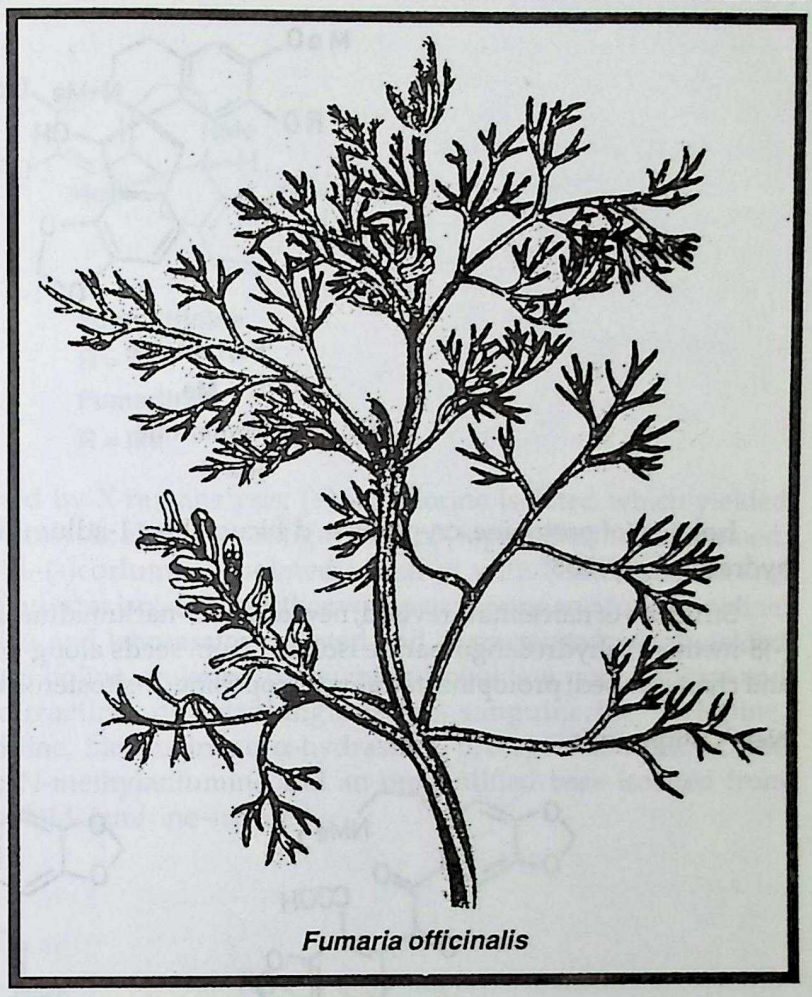
Botanical Description

An annual herb with a weak, low-branching, leafy stem. The stalked, alternate, grey-green leaves are several times pinnately divided into flattened lanceolate segments. The small tubular flowers are arranged in long racemes. The petals are pink with dark-red tips, the upper one spurred. The fruit is a rough achene. *All parts of the plant are poisonous.*



Fumaria officinalis

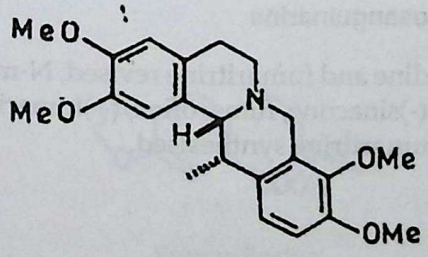
Habitat

Common Fumitory is a common weed of cultivated ground and roadsides all over Europe, including the British Isles, especially on light soils. The generic name, *Fumaria*, and the common name are derived from the Latin words *fumus terrae* (literally meaning 'smoke of the earth') because the plant has an unpleasant smoke-like smell, it irritates the eyes and also because the leaves give the appearance of smoke rising from the ground. Common Fumitory has long been used for medicinal and cosmetic purposes; it is still widely used by herbalists.

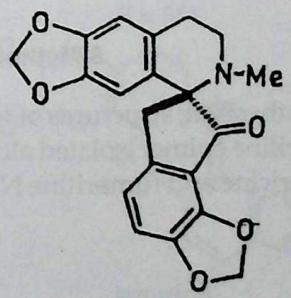
Constituents

Detection of alkaloids–corydaline, protopine, bulbocapnine and dicentrine by PC; stereochemistry of corydaline; alkaloids–fumarophycine, mp. 107°, protopine and sinactine–isolated from Bulgarian plant; known alkaloid–scoulerine–and three new bases–fumaricine, fumaritine and fumariline–isolated; structures of new bases established.

New Compounds



Corydaline



Fumariline

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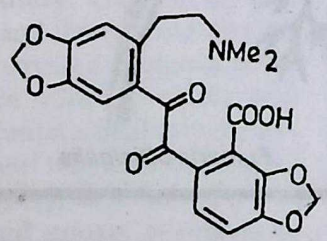
Furnaricine
R = Me
Fumaritine
R = H

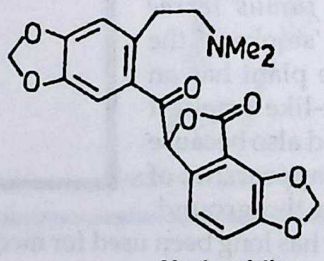
Isolation of protopine, cryptopine, d-bicuculline, 1-adlumine, fumaridine, fumaramine and d-α-hydrastine, mp. 158°.

Structure of narceimine revised; new alkaloid–narlumidine–isolated together with (+)adlumidine; (-)8-methoxydihydrosanguinarine isolated from seeds along with fumariline and oxysanguinarine and characterised; protopine, tetrahydrocoptisine, β-sitosterol and octacosanol identified in roots.

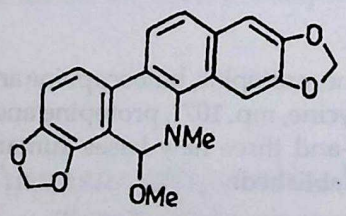
New Compounds



Narceimine



Narlumidine



8-Methoxydihydrosanguinarine

Fumaricine synthesised; structures of fumaritridine and fumaritrine revised; N-methyl-sinactine and a dihydrofumariline epimer isolated along with (-)sinactine, fumarofine, (+)fumariline, protopine, cryptopine, (-)fumaricine and fumaritine N-oxide; fumaritrine synthesised.

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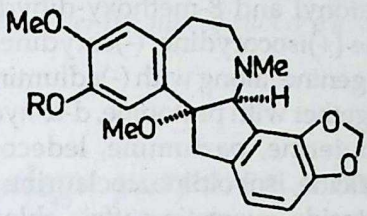
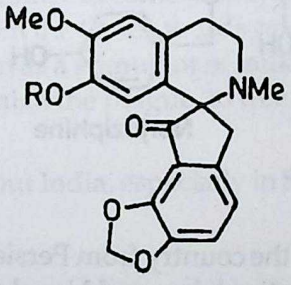
New Compounds



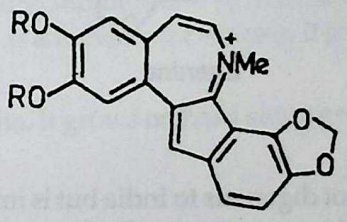
Fumaritridine
R = H
Fumaritrine
R = Me

Structure of parfumine confirmed by X-ray analysis; (+)parviflorine isolated which yielded (+)parfumine and glucose on acid hydrolysis; absolute configuration of (+)parviflorine determined; new phthalideisoquinoline alkaloid–(-)corlumine–isolated together with (-)adlumidine and (-)cheilanthifoline; fumariflorine as ethyl ester isolated, together with parviflorine and fumaramidine; indenobenzazepine alkaloids–lahorine and lahoramine–isolated and characterised; plant yielded 0.39% total alkaloids, of which cheilanthifoline, sculerine, paerfumine, isoboldine, noryuziphine and coclaurine isolated from phenolic fraction; dihydrosanguinarine, sanguinarine, stylopine, oxosanguinarine, adlumine, aldumidine, bicuculline, d-α-hydrastine, protopine and fumaricine isolated from nonphenolic fraction; N-methyladlumine and an unidentified base isolated from quaternary alkaloid fraction; new alkaloid–izmirine–isolated.

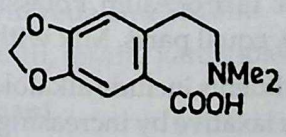
New Compounds



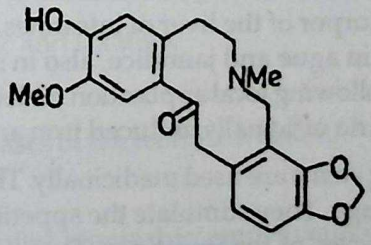
Parfumine
R = H
Parviflorine
R = Glu



Lahorine
R,R = -CH_2-
Lahoramine
R = Me



Fumariflorine



Izmirine

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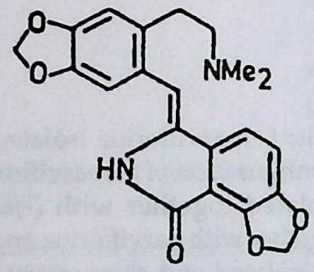
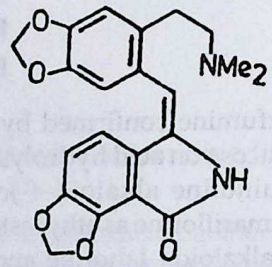
Structure of (Z)fumaramine revised; new alkaloid (E)fumaramine–isolated from aerial parts and characterised; oxysanguinarine, 8-acetonyl and 8-methoxy-dihydrosanguinarine, fumaramidine, dihydrosanguinarine, norsanguinarine (+)isocorydine, (-)corydine and (+)juziphine also isolated a phthalideisoquinoline hemiacetal–(+)egenine–along with (-)adlumine, (-)capnoidine and (-)corledine isolated; N-methyladlumine isolated together with protopine, d-α-hydrastine, bicuculline, adlumidine, adlumine, stylopine, fumariline, scoulerine, parfumine, ledecorine, hydroxymethylstylopine, adlumidiceine, cheilanthifoline, norjuzicine, isoboldine, coclaurine and reticuline; norjuziphine and stylopine isolated and characterised; rutoside, quercetin, caffeic, chlorogenic and ferulic acids isolated.

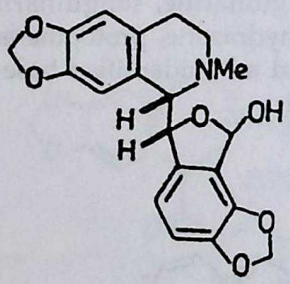
New Compounds



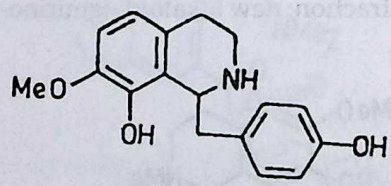
(Z)Fumaramine



(E)Fumaramine



Egenine



Norjuziphine

Uses

F. officinalis is not digenous to India but is imported into the country from Persia. An allied variety, *F. parviflora*, is found in many parts of India from Indo-Gangetic plain, –and Nepal down to the Nilgiri mountains. The plant is found to contain *Fumaric acid* (isomeric with malic acid), and *fumarine* (an alkaloid), a crystalline organic base. A decoction of the plant (1 in 20) or an infusion prepared from the stem and the leaves, is given in doses of 1 to 2 ounces thrice daily, as diaphoretic, tonic, diuretic, anthelmintic, aperient, (laxative) and alterative; useful in syphilis, scrofula, leprosy, constipation and dyspepsia due to torpor of the liver of intestines. It is allied in its properties to taraxacum. With black pepper it is given in ague and jaundice, also in skin diseases to purify the blood. The *Shafa-ul-Imraz* recommends the following local application for leucoderma: Take of Alum, Potassium Nitras, Armenian Bole (*Bolos*), Fumaria officinalis, reduced iron and *Wasma*, equal parts. Mix with vinegar and apply.

The flowering stems are used medicinally. Their constituents include alkaloids (mostly fumarine), tannins and mucilage. They stimulate the appetite and are laxative by increasing the peristaltic action of the smooth muscles of the intestines. They are also diuretic and choleretic, Externally Common Fumitory is a good skin cleanser and it is used in the treatment of certain skin disorders such as

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eczema. In a mixture with the leaves of Walnut (*Juglans regia*) it heals haemorrhoids. Common Fumitory is toxic and large doses can cause severe diarrhoea, muscular spasms, and even respiratory failure. *It should therefore be taken internally only under the supervision of a qualified medical or herbal practitioner.*

Galega purpurea, Linn.
(Family: Papilionaceae)

Vernacular Names

Sans.–Puleehashtra, Neelabralakrati, Sarapunkha; *Hind.*–Sarphenka, Sarphankha; *Ben.*–Bannilgach, Bon-nil; *Punj.*–Bansa; *Bom.*–Jangil kulthi, Sarphankha; *Guj.*–Jhila, Ghila; *Mah. & Duk.*–Untoali, Unhali, Surpanaka; *Tel.*–Vempali, Pamparachettu; *Tam.*–Kolluk-kay-welai, Kolinji, *Mal.*–Kazhinnila, Kazlumnilla; *Can.*–Kaggi; *Eng.*–purple Tephrosia.

Botanical Description

A bushy perennial herb with an erect, angled, hairless stem. The alternate leaves are odd-pinnate with four to twelve pairs of oblong leaflets and large sagittate stipules. The white, pinkish or lilac flowers are arranged in longish erect racemes in the leaf axils. The calyx is bell-shaped with five bristle-like teeth. The fruit is a straight, red-brown smooth pod with many brown seeds.

Habitat

Goat's Rue is a native of southern and eastern Europe and western Asia. It was supposedly introduced into the British Isles from France as an ornamental garden plant, hence the alternative common name. It has since become widely naturalized on damp and waste ground. The generic name, *Galega*, is derived from the Greek words *gala* (= milk) and *agere* (= to promote) and refers to the herb's traditional reputation as a stimulant of milk flow in nursing mothers and in livestock. Goat's Rue was also once used to banish the plague, to treat fevers and as a remedy for worms. It is still occasionally used in herbalism.

Found throughout India, especially in Southern India. It grows on hard stony ground too difficult to be rooted.

Constituents

The plant yields gum, a trace of albumen and colouring matter, ash containing a trace of manganese; brown resin and chlorophyll and a principle allied to quercetin or querritrin and glucoside rutin.

Action

Febrifuge, cholagogue, diuretic, deobstruent, tonic and laxative.

Action and Uses in Ayurveda and Siddha

Ushna veeryam, katu, rasam, katu vipakam, diseases of the teeth, salivation.

Action and Uses in Unani

Hot 3°, Dry 3°, resolves stone in kidney, diuretic, piles, stomachic, emmenagogue.

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Uses

The drug is useful in cough, asthma and tightness of the chest; *powder of the root* is smoked in *Hookah* or *Chilmi*. *Root* ground into *paste* with turmeric and rice water or cow's milk is applied to scrofulous glands; a powder of the root is also used as a snuff. A *decoction of the root* with pepper powder added is given in bilious febrile attacks, enlargement and obstruction of the liver, spleen and kidneys. For hepatic dropsy, the root ground in butter-milk is given. Root is also recommended for boils, pimples, abscesses especially carbuncles on the back, as tonic and laxative and as purifier of blood. Its *leaves* in combination with the leaves of Cannabis Indica in the proportion of 2 to 1 respectively or its root ground in curds is a remedy for bleeding piles, and with black-pepper it acts as diuretic in gonorrhoea. *Root in decoction* is given in dyspepsia and chronic diarrhoea, and as a wash for the mouth. *Root powdered* and mixed with honey is applied to ulcers. *Root bark* ground and made into a *pill* with black-pepper is very beneficial in obstinate colic. A powder of the root taken with water for about a month will cure enlarged scrotum. An *infusion of the seeds* is employed as an anthelmintic for children. For itch, scabies etc., the *oil of the seeds* is a specific remedy. For tumours the *ashes of the plant* mixed with the powder of chebulic myrobalan, in equal parts, is administered in doses of 1 drachm. Seeds of the white variety may be beneficial in the poison of rat; the root is said to be an antidote to snake-bite. "Cattle feed on this plant as it is a fair fodder before flowering. Can be made into silage and some use it as a green manure."

The flowering stems are used medicinally. Their constituents include the alkaloid galegine, flavonoid glycosides, saponins and tannins. These substances give Goat's Rue hypoglycaemic, galactagogic, diuretic and diaphoretic properties. It is mostly used in an infusion for nursing mothers. On the Continent an extract from Goat's Rue is also applied in ointments used to hasten skin healing after plastic surgery.

Galeopsis segetum
(Family: Labiatae)

Vernacular Name

Eng.–Downy Hempnettle.

Botanical Description

An annual herb with an erect, branched, square stem. The leaves are opposite, ovate to lanceolate and serrate, and from their axils grow the pale-yellow flowers arranged in apparent whorls. The corolla is two-lipped; the upper lip is helmet-shaped, the lower lip has three spreading lobes. The fruit consists of four one-seeded nutlets. All parts of the plant are softly hairy.

Habitat

Downy Hempnettle is native to western Europe where it grows on arable land and in waste places. In some countries it is cultivated commercially for the pharmaceutical industry. In the British Isles it is an extremely rare species and should not be collected in the wild. A related species, Common Hempnettle (*G. tetrahit*) is, however, a widespread and common weed in Britain. It grows in woods, fens and wet heaths. The flowers of Common Hempnettle are pinkish purple, less often yellow or white, with a network of dark markings on the lower lip. The generic name of hempnettles, *Galeopsis*,

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is derived from the Latin word *galea* (= a helmet), a reference to the shape of the flowers. The specific epithet, *segetum*, means 'cornfield'. The leaves of hempnettles are similar to the leaflets of Hemp (*Cannabis sativa*), hence the common name. Botanically and medicinally, however, there is no resemblance between the plants. In the Middle Ages Downy Hempnettle was used to treat wounds, swellings and tuberculosis. It is still used for various internal complaints and skin disorders.

Uses

The flowering stems are the medicinal parts. Their constituents include tannins, saponins, a glycoside, traces of an essential oil and silicic acid. These substances give Downy Hempnettle diuretic, astringent, stomachic and expectorant properties. It is used in tea mixtures to treat chest colds, cough, whooping cough, bronchitis, to stimulate the appetite, improve digestion and to treat disorders of the spleen. A tincture is used in homeopathy for the same purposes.

Other species of hempnettle have similar medicinal uses.

Galium verum
(Family: Rubiaceae)

Vernacular Name

Eng.–Lady's Bedstraw.

Botanical Description

A perennial herb with a creeping rhizome and decumbent or erect branched square stems. The linear leaves, which are arranged in whorls of eight to twelve, have turned-under margins, a prominent midrib and are dark green and shiny above, pale and felted below. The small, bright-yellow, honey-scented flowers are arranged in dense terminal panicles. The four pointed lobes of the corolla spread horizontally like a wheel from the top of a very short tube. The fruit is a smooth double achene, green at first and black when dry.

Habitat

Lady's Bedstraw is common and widespread throughout Europe, including the British Isles. The green parts of the plant contain the enzyme parachymozine, which causes milk to curdle, and the herb was once used in cheese-making, hence one of its common names, Cheese Rennet. The generic name *Galium* (from the Greek word *gala* = milk), is thought to refer to this milk-curdling property, which is possessed by many other plants in the Rubiaceae (bedstraw) family. According to a Christian legend this was one of the herbs in the hay in the manger at Bethlehem. It was from this belief that the plant was given the name Lady's Bedstraw by which it is mainly known today. The leaves and stems produce a yellow dye, the roots a red dye. The related Goosegrass or Cleavers (*G. aparine*) also has medicinal properties. It can easily be distinguished from Lady's Bedstraw because it has backward-pointing prickles along the angles of the stem, whitish flowers and the green and purplish fruit is covered with white hooked bristles. Lady's Bedstraw and Goosegrass are still used in herbalism.

Constituents

Two new iridoids–V1 and V3–along with asperuloside and daphylloside isolated from aerial parts and their structures elucidated.

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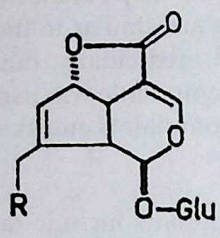
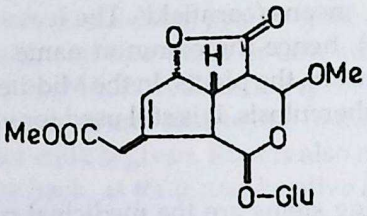
New Compounds



Iridoid V1

R = α, β-Dihydro-p-coumaroyl



Iridoid V3

Uses

The flowering stems of Lady's Bedstraw contain glycosides, traces of an essential oil, silicic acid and enzymes. These substances give the plant diuretic, antiseptic and antispasmodic properties. It is used in an infusion for kidney and urinary disorders. Externally it is used in compresses to treat slow-healing wounds, skin rashes and ulcerous conditions.

Galium odoratum

(Family: Rubiaceae)

Vernacular Names

Eng.–Woodruff, Sweet Woodruff.

Botanical Description

A perennial carpeting herb with unbranched, hairless, erect, square stems that grow from a tangle of rhizomes and rootlets in early spring. The leaves, in whorls of six to eight, are lanceolate with tiny, forward-pointing prickles on the margins. The small, white, star-shaped flowers are arranged in dichasial cymes. The corolla is funnel-shaped with the tube a little shorter than the free lobes. The fruit is a double achene with hooked, black-tipped bristles. All parts of the plant are pleasantly hay-scented, especially when dried.

Habitat

Widespread throughout Europe, Woodruff has been collected and cultivated since the Middle Ages. It has been–and is still–used in European countries to flavour wine (May cups) and it was put amongst linen to keep away moths. It grows throughout most of the British Isles in woods, especially on damp, lime-rich soils where it can be locally common. The vernacular name, Woodruff, is derived from the Anglo-Saxon word *Wudurofe*, from *wudu* (= wood) and *rofe* of unknown origin, but it may mean 'root', a reference to the plant's creeping habit.

Constituents

Structure of iridoid glucoside–asperuloside.

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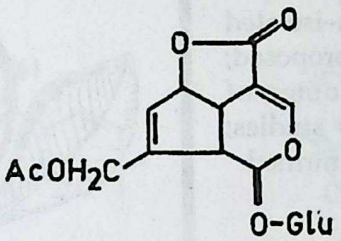
New Compounds



Asperuloside

Uses

The flowering stems are used medicinally. Their constituents include a coumarin glycoside (responsible for the hay-like aroma), tannins and bitter compounds. These substances give Woodruff sedative, diuretic, vulnerary and antispasmodic properties. In herbalism it is used in the form of an infusion or decoction to treat nervous irritability, overwork, muscular spasms of various kinds, heart palpitations and insomnia. *Strong doses may cause vertigo, vomiting and headache.* Externally compresses of Woodruff are used to treat slow-healing wounds, skin rashes and ulcerous conditions. The herb is also occasionally used in homeopathy. It is an effective moth repellent.

Garcinia morella, Desr.

Vernacular Names

Sans. & Ben.–Tamal; *Hind.*–Gotaghanba; *Eng.*–Indian gamboge; *Bom.*–Kokum; *Tam.*–Korakpuli, Trevalchinippal; *Tel.*–Rival-chinipal; *Can.*–Lamal. Gum resin is purgative.

Botanical Description

Indian gamboge is a yellow gum or gum resin that exudes from several species of large trees in Siam, Ceylon and Malabar. It is exported from Cambodia or Cambogia (whence its name) in cylindrical rolls or masses. The best kind of Indian gamboge dye is of a reddish yellow appearance of a dense compact nature. A fast-yellow dye is produced when used with pomegranate rind and as alum mordant.

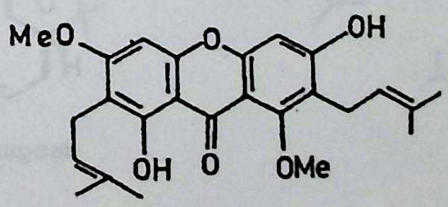
Habitat

Found in South India.

Constituents

Structure of β-mangostin from latex, shown as 1,6-dihydroxy-3,7-dimethoxy-2,8-bis-(3-methyl-2-butenyl)xanthone.

New Compounds



β-Mangostin

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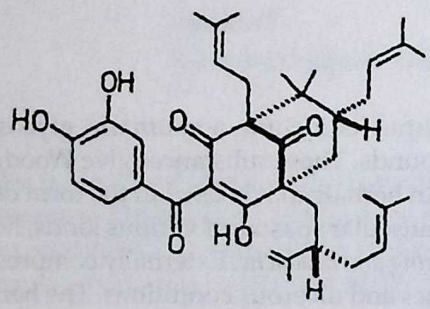
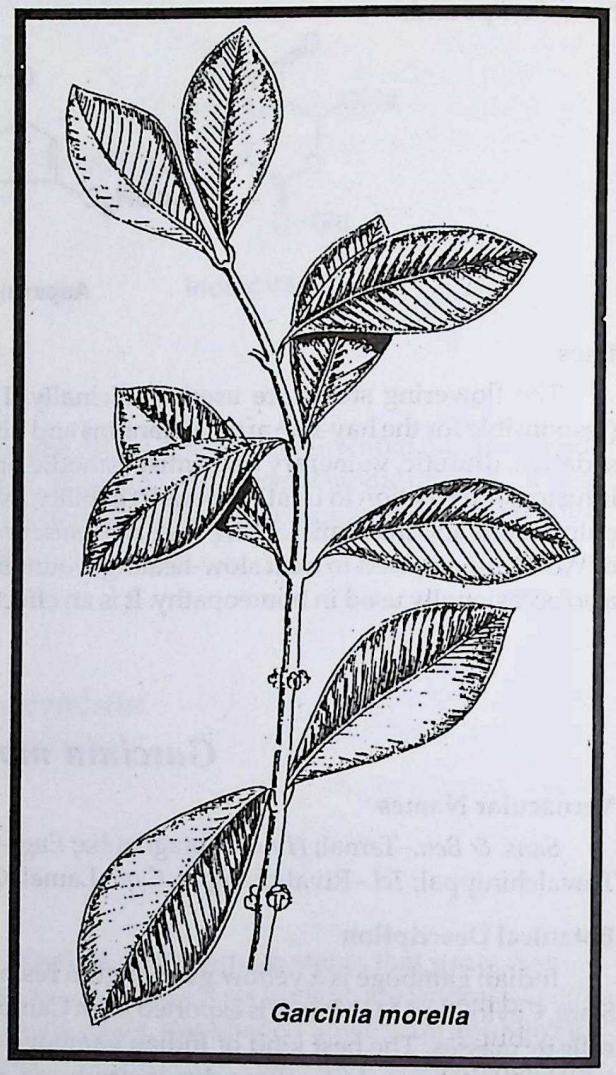
Two isoprenylated benzophenone derivatives–camboginol and cambogin–isolated from latex and structure of cambogin proposed; structure of cambogin, an enantiomer of isoxanthochymol, confirmed by X-ray studies; structure of camboginol revised and confirmed.

New Compounds

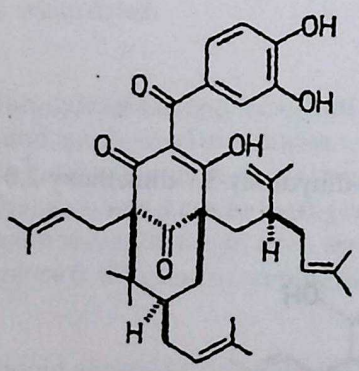


Camboginol

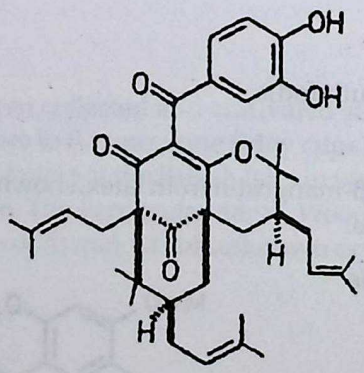
Two polyisoprenylated phenolic pigments–garcinol and isogarcinol–isolated from fruit rind and their structures proposed; proposed structures of garcinol and isogarcinol warrant revision; structure of isogarcinol determined by crystallography analysis and found to be the same as that of cambogin; garcinol and camboginol (which have same physical data and 13-C NMR) may also be identical, the reported differences in UV spectra not withstanding; (-)hydroxycitric acid, cyanidin-3-glucoside and cyanidin-3-sambubioside isolated from fruits.



New Compounds



Garcinol



Isogarcinol

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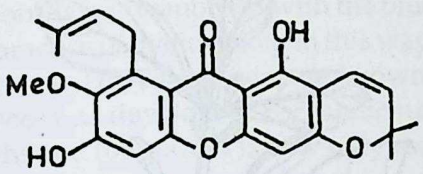
New Compounds



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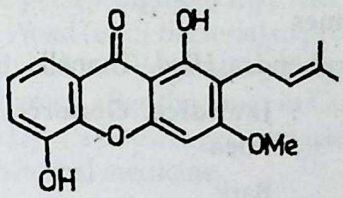
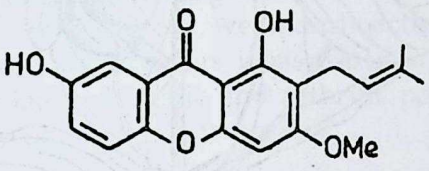
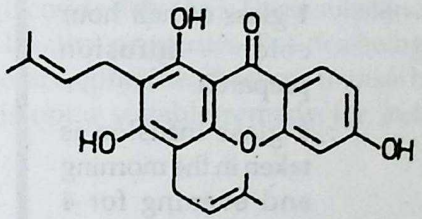


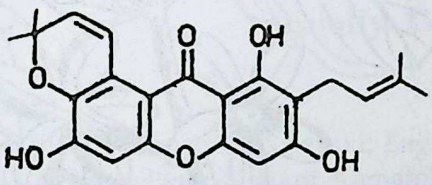
II



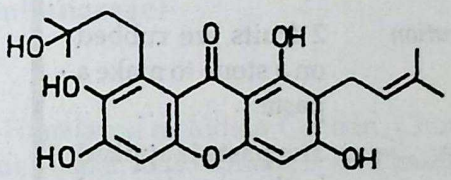
III



Garcinone A



Garcinone B



Garcinone C

Mangostin isolated from fruits; three new xanthones–garcinones A, B and C–isolated from fruit hulls and their structures determined; a new xanthone–5,9-dihydroxy-8-methoxy-2,2-dimethyl-7-[3-methylbut-2-enyl)-2H,6H-pyrano(3,2-b)xanthone-6-one (I)–isolated from fruit hulls; two new trioxygenated xanthones–1,5-dihydroxy-2-(3-methylbut-2-enyl)-3-methoxyxanthone (II) and 1,7-dihydroxy-2-(3-methylbut-2-enyl)-3-methoxyxanthone (III)–isolated from fruit hulls.

Biological Activity

Mangostin inhibited systemic anaphylaxis, Schultz-Dale's reaction and immunocytoadherence in guinea pigs and rats. It also significantly inhibited primary and secondary responses of adjuvant-induced arthritis in rats; mangostin exhibited activity against both normal and penicillin-resistant strains of *Staphylococcus aureus* MIC 7.8 µg/ml; mangostin showed activity against *Trichophyton mentagrophytes, Microsporum gypseum* and *Epidermophyton floccosum* at concentration of 1 mg/ml, but had no effect on *Candida albicans*.

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Gardenia turgida

Vernacular Names

Mah.–Khurphendra; *Hind.*–Thanella.

Illness : **Jaundice, Gonorrhoea**

Part used : Bark

Preparation : A 4-finder piece of bark is crushed and 1 glass of half hour cold infusion prepared.

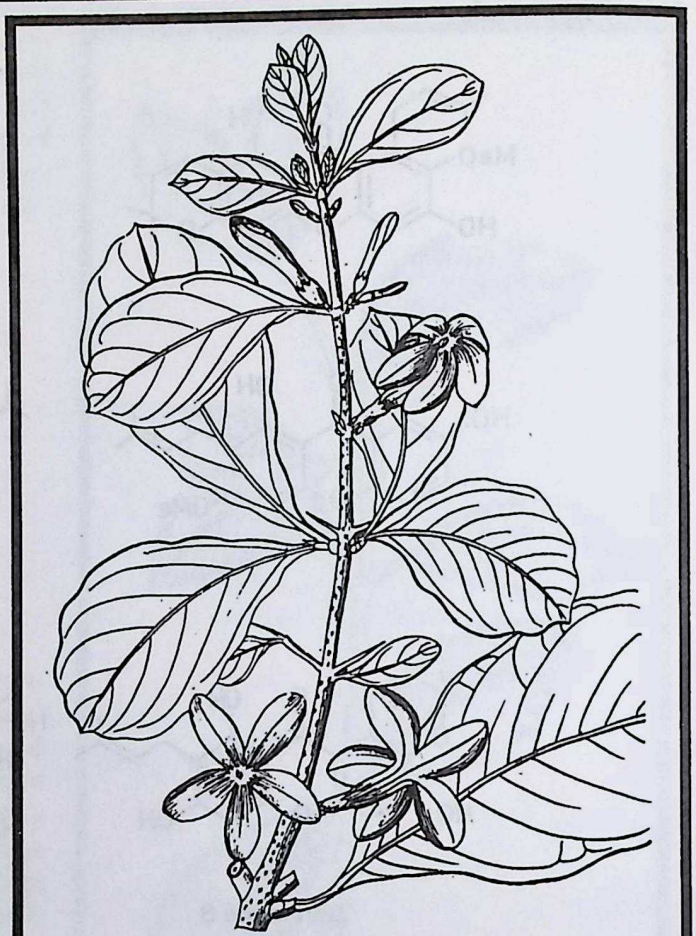
Dosage : 1 glass infusion is taken in the morning and evening for 4 days.

Illness : **Mumps**

Part used : Fruits

Preparation : 2 fruits are rubbed on a stone to make a paste.

Dosage : The paste is applied in the morning and evening for 5 days.



Gardenia turgida

Genista tinctoria

(Family: Leguminosae/Fabaceae)

Vernacular Name

Eng.–Dyer's Greenweed.

Botanical Description

A small deciduous spineless shrub with a creeping woody rhizome and erect or ascending smooth, green stems. The alternate, almost sessile leaves are lanceolate. The yellow flowers are arranged in terminal leafy racemes. Like other members of the Leguminosae (pea) family the plant has characteristic flowers with a large upper petal (standard), two side petals (wings) and two lower petals jointed along their edges (keel). The fruit is a long, flat, hairless pod.

Habitat

Dyer's Greenweed is found throughout most of Europe at the edges of woods and by roadsides, mostly in dry places. It is also grown as a garden plant. In the British Isles it is a widespread but

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uncommon native plant in England and Wales and southern Scotland; it is rare in northern Scotland and absent in Ireland. The leaves and flowers contain a yellow pigment that was once used to dye cloth and wool. It was combined with the blue dye from Woad (*Isatis tinctoria*) to produce an excellent green. The practice of dyeing cloth in this way was introduced into England by Flemish immigrants in the 14th century. The colour become known as Kendal green after the town in Cumbria where the dyeing of wool was developed. For medicinal purposes Dyer's Greenweed was used as a laxative, to expel uroliths and for gout. It is now only rarely used in herbal medicine.

Uses

The flowering stems are the medicinal parts. Their constituents include the alkaloids cytisine and sparteine, the flavonoid genistein and a yellow glycoside (luteolin). These substances give Dyer's Greenweed strong diuretic, weak cardioactive and laxative properties. Besides being a remedy for kidney and urinary disorders, it has also been used to strengthen heart action, to raise blood pressure and to alleviate rheumatic and arthritic pain. It is not a suitable remedy for individuals with hypertension or for pregnant women.

Gentiana lutea
(Family: Gentianaceae)

Vernacular Names

Sans.–Kiratatikta, Anaryatikta, Katuki; *Eng.*–Himalayan or Indian Gentian, Chiretta; *Hind. & Ben.*–Karu, Kutki, Chireta; *Punj.*–Nilkant, Kamalphul, Milakil; *Kash.*–Kiraita; *Bom.*–Phashanveda; *Guj.*–Kadu chirayata, Pakhan-bhed; *Mah.*–Kirayet; *Tel.*–Nelavemu; *Tam.*–Nilavimbu; *Mal.*–Kiriyat; *Can.*–Kiriyatu; *Kon.*–Jirate-kaddi; *Burm.*–Sekhage; *Malay.*–Chrita; *Sinh.*–Bincohamba.

Botanical Description

A perennial herb with a thick rootstock and a basal rosette of large, elliptical, bluish-green leaves with prominent veins on the underside. Not till it is four to eight years old does it bear a tall, unbranched, hollow stem with opposite, sessile, oval leaves. The showy, stalked, golden-yellow flowers grow in tight clusters in the axils of the uppermost leaves. The anthers are almost as long as the corolla. The fruit is a capsule with many winged seeds.

Habitat

This species abounds round Shimla, extending to Kashmir and N.W. Himalayas at altitudes of 5 to 10 thousand feet. Numerous other varieties of this drug, e.g., G. decumbens, G. tenella, etc., are found in almost every part of India.

Native to the Carpathians, Great Yellow Gentian occurs rarely in the other mountain ranges of Europe and Asia. In many countries it is now protected having been over-collected in the past for the roots, which are used in the production of gentian brandy and bitter liqueurs. It is not native to the British Isles but it is grown as an ornamental plant in gardens. The plant is now commercially cultivated for the wine and pharmaceutical industries in Eastern Europe and America. It is regarded as one of the best herbal tonic medicines available. It may have acquired its name, *Gentiana*, from Genius, King of Illyria, who is reputedly the first person to have used the plant medicinally.

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Parts Used

Root-stalk (rhizome), roots and the entire dried plant.

Constituents

It contains the same principles as the European root-gentian bitter, gentianic acid, pectin, and an uncrystallizable sugar. Other varieties contain *chiratin* and *opelic acid* to which is due the bitterness. A sample of the dried roots was analysed at the Forest Research Institute, Dehradun, with the following results—Aqueous extract 20%, Ash 0.70%, Gentiopicrin nil. Gentiopicrin which is considered to be the active principle of the fresh European *G. lutea*, is absent in the dried Indian *G. kurroo*, but if fresh Indian *G. kurroo* roots are analysed, gentiopicrin etc. may be present.

Action

Bitter tonic, antiperiodic, antibilious, astringnet, stomachic and anthelmintic, in large doses aperient. In these properties different varieties differ in their strength.

Uses

Gentian has been known as a medicine from antiquity and many of the complex preparations handed down from the ancient Greek and Arabian physicians include it among their ingredients. It is one of the most important bitters in the Pharmacopoeia and is very extensively used. It possesses in a high degree the tonic properties, which characterise all the simple bitters. On account of its aromatic properties it is agreeable to take and because of the absence of tannin it bas no astringent action. It is, therefore, preferred to many other bitters and enters into most of the stomachic and tonic prescriptions of modern practice. Stems and roots are efficient substitutes for the imported gentian; *tincture* and *infusion* closely correspond to those of the European gentian, *G. lutea*. It is a favourite remedy in intermittent fevers, acidity and in bilious dyspersia accompanied by fever, combined with acids it is specially serviceable in the dyspepsia of gouty persons and in functional inactivity of the liver. A *decoction* of the root with its equal quantity of *sunth* and *dikamali*, or an infusion of chiretta in cold water with the addition of 4 grains each of camphor and *shilajit* and ½ tola of honey are popular remedies in all cases of debility after fevers, in indigestion, loss of appetite etc. It is also used in catarrhs, syphilis, leprosy and other skin diseases. In the form of infusion mixed with a little powder of long pepper it is useful in fevers accompanied by coughs and difficulty of breathing; a *powder* of the root mixed with honey is given in hiccup and to stop vomiting. Chiretta, as antibilious, is used as a diet, in fistula in ano, when there is no fever. Following confection is useful in malaria and reduces enlargement of spleen and liver after its prolonged use, in doses of ¼ to ½ tola twice a day: It is made of Gentian root and black pepper each 1 drachm, Aplotaxis auriculata, Cinnamomum tamala, Valerianea radix and Rhei redix each 7 *mishals*, and honey 11 *palams*. Powder all the ingredients and mix them with honey which is previously boiled and cooled. Following Ayurvedic preparations are also in popular use among Hindu physicians:

1. A decoction made of equal parts of Chiretta, *gulancha*, raisins, emblic myrobalan and zedoary root, is useful in fevers caused by *Vata-pitta*.
2. A compound powder called *Sudarsana churna* prepared by taking equal parts of 54 different substances and of chiretta equal to half the weight of all the other ingredients and mixing them together. It is largely prescribed in chronic febrile diseases. Bhishagwara K. Achaiah of Bellary has cured "Impetigo contagiosa" (known in Ayurveda as "Ajagallika") a popular contagious disease of children, by cleaning the parts well with warm water and applying a mixture of 10 grains *Sudarsana churna* and 10 grains *Tankana Khara*. By the time two or three

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applications were made the pustules healed leaving a red surface with new cuticle in it. This mixture is a good substitute to mercury used by Allopaths in this ailment.

3. *Kiratadi taila* or oil of chiretta: this is made by mixing together 4 seers each of concentrated decoction of chiretta, mustard oil, *Kanjaka* and whey, and two tolas each of 24 other substances in the form of a paste and boiling them together to the consistence of a thick oil. This oil is used for rubbing on the body in chronic fever with emaciation and anaemia.
4. *Bhoonimbadhi Churnam*, which is made of Chiretta, Picrorrhiza Kutooa, *trikatu*, Cyperus rotundus, seeds and bark of Holarrhena antidysenterica, and Plumbago zeylanica; used in dyspepsia, chronic diarrhoea, fevers, dysentery and worms.
5. *Panchathikthaka* powder and decoction which consist of equal parts of chiretta, Cocculus cordifolia, Oldenlandia herbacea, Clerodendron serratum, tubers of Cyperus rotundus and dry ginger; dose-one drachm of the powder in decoction twice a day.
6. *Panchathikthaka panakam* which is prepared by boiling equal parts of Chiretta, Picrorrhiza kurooa, *parpataka*, tubers of Cyperus rotundus and Cocculus cordifolia, in 16 parts of water, till reduced to its quarter volume and then adding sugar equal to the weight of the powders, to convert it into syrup; *dose*-½ ounce twice or thrice a day given in conjunction with *Ananda Bhairavi* or *Jwaramurari* pills, in malarial fever with enlarged spleen.

Following are simple Home Remedies containing Chiretta and useful in various common ailments:

1. Take of one ounce of Chiretta and one drachm each of cloves and cinnamon and infuse them in one pint of boiling water for six hours and strain; dose-two ounces before food twice daily as a tonic.
2. Take of one tola each of smashed chiretta and coriander seeds, boil them together in 16 ounces of water till reduced to 4 ounces; dose-2 ounces twice daily with a few drops of honey, used in cases of torpid liver.
3. Take two ounces of the bruised stems of chiretta, add them to a bottle of sherry and let it stand for a week; dose-2 ounces once or twice daily one hour before meals, taken for debility after fevers, indigestion, loss of appetite etc.
4. A compound tincture of chiretta is made, thus—Take of 1½ ounces of bruised chiretta, ¾ ounce of bruised orange peel and ¼ ounce of cardamom seeds freed from the pericarps and bruised; macerate all these together in 1 pint of Proof Spirit for seven days in a closed vessel, with occasional agitation; then strain, press, filter and add sufficient Proof Spirit to make one pint; dose-one to two drachms in water. An excellent tonic and also a valuable adjunct to other tonics.

The roots of old plants are used. Among the constituents are the bitter glycosides (for example, gentiopicrosides), a flavonoid derivative (gentisin), alkaloids, sugars and pectin. These substances give Great Yellow Gentian a markedly bitter taste and it acts as a tonic on the whole digestive system. Taken at least half an hour before meals it stimulates the appetite, and promotes the flow of digestive juices and bile. It is used in conventional and homeopathic medicine as well as in herbalism.

The fermented root is used in the manufacture of bitter foodstuffs and liqueurs. Before fermentation the root is dried slowly until it turns a reddish-brown colour (for medicinal uses the root is dried quickly so that it retains its yellow colour).

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Geranium robertianum

(Family: Geraniaceae)

Vernacular Name

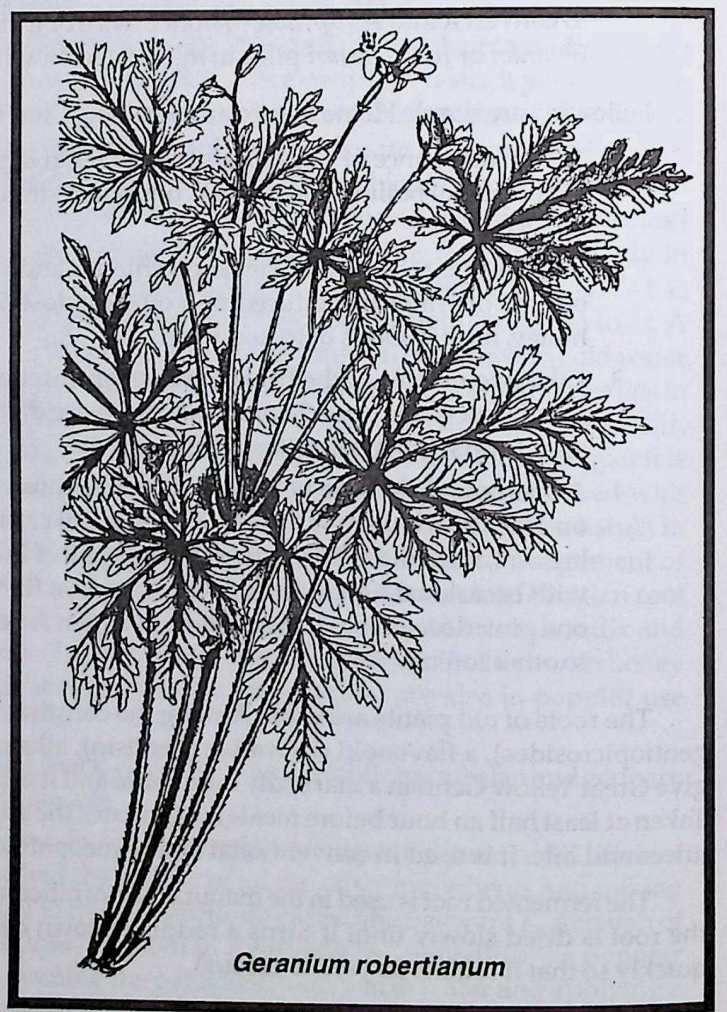
Eng.–Herb Robert.

Botanical Description

An annual or biennial herb with thin, reddish, glandular stems that branch stiffly. The long-stemmed alternate leaves are palmately divided into three to five lobes, which in turn are divided twice over. The reddish-violet flowers are long-stalked and usually grow in pairs. The beaked fruit is a schizocarp that splits when ripe into one-seeded parts (merocarps). The merocarps have a network of ridges and a white hair tuft near the apex. The whole plant is densely hairy and smells unpleasantly when rubbed between the fingers.

Habitat

Herb Robert grows throughout Europe, including the British Isles, in woods, thickets, hedgerows and on rocks and walls. The generic name, *Geranium*, is derived from the Greek word *geranos* (= a crane), a reference to the pointed 'beak' on the fruit. This is why other *Geranium* species have the name cranes-bill. The 'robert' of the plant's common name is believed to be a corruption of the Latin word *ruher* (= red) or to refer to Robert, Duketise Normandy, for whom a medieval treat was written. The plant may also be named after St. Robert, an eleventh-century French ecclesiastic. Herb Robert is still used in herbalism.



Geranium robertianum

Constituents

Gallic acid, 3-methoxygallic acid, quercetin, kaempferol and 3,7,8,4'-tetrahydroxyflavone from leaves; isolation of quercetin-3α-L-arabinofuranoside, m.p. 217° and quercetin-3α-L-arabinopyranoside, m.p. 237°, from leaves.

An unidentified steroid, m.p. 136°, catechin, tannin, gallic acid, L-epicatechin, D-catechin, chebulagic acid, 6-galloylglucose and ellagic acid from rhizomes.

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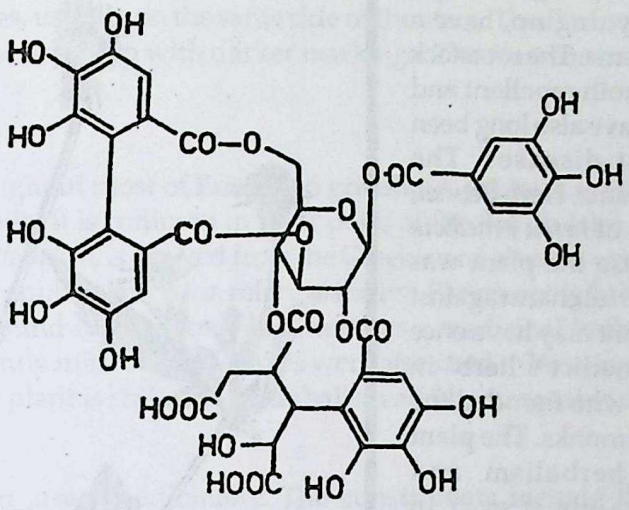
New Compounds



Chebulagic acid

Detection of (-)epigallocatechol, l-gallocatechol, (-)epicatechol, (±)catechol and epicatechol gallate in roots and (+)catechol in stalks by PC.

Uses

The flowering stems are use medicinally. Their constituents include an essential oil, tannins and the bitter compound geraniin. These substances give Herb Robert astringent and diuretic properties and it is used in an infusion to check pulmonary haemorrhage and nose-bleeding, and to treat severe diarrhoea, kidney and bladder disorders. Externally compresses and ointments are used to treat various skin disorders, boils and septic cuts. A decoction can be used as a gargle for tonsillitis.

Geum urbantum

(Family: Rosaceae)

Vernacular Name

Eng.–Wood Avens.

Botanical Description

A perennial hairy herb with a thickened rhizome and an erect branched stem. The basal leaves are stalked and odd-pinnate, with two or three pairs of unequal-sized leaflets and a large, lobed, terminal leaflet; the smaller alternate stem leaves are trifoliate and have paired, leaf-like stipules. The erect, solitary, terminal flowers have recurved sepals and spreading yellow petals. The fruit consists of a sessile group of achenes with hooked appendages. The hooked fruits are spread by becoming attached to the fur or feathers of passing animals.

Habitat

Wood Avens grows throughout most of Europe in shady places on damp rich soil. It is common in the British Isles. The generic name, *Geum*, is derived from the Greek word *geyo* (= I stimulate) because

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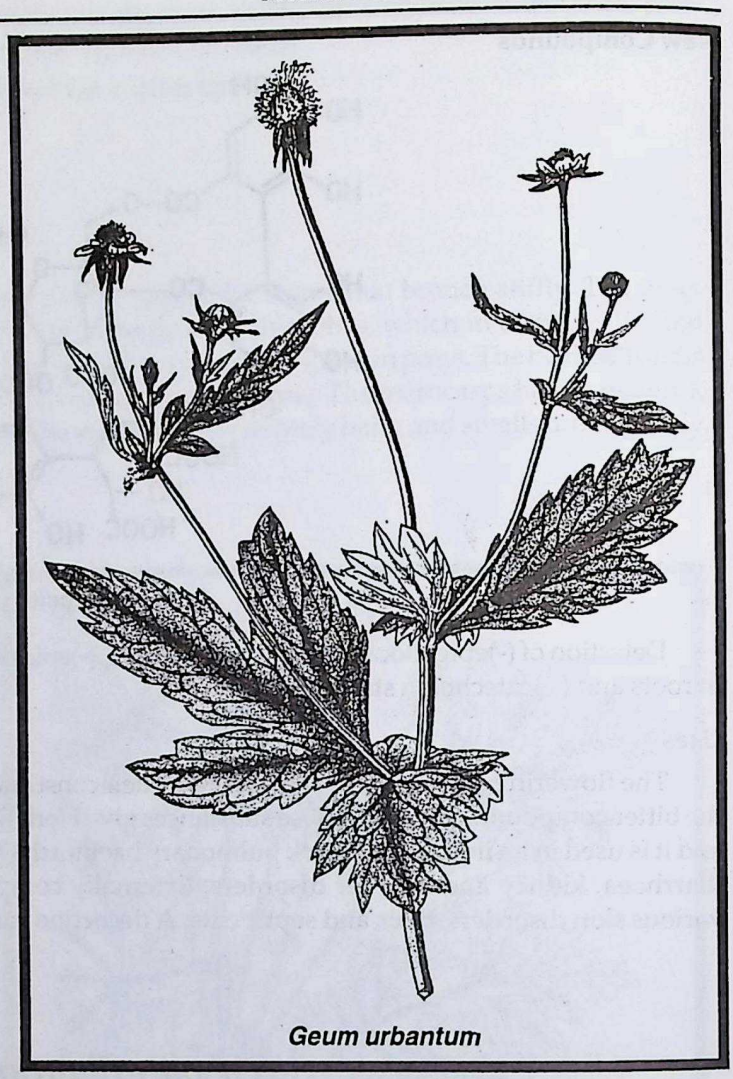
the rootstocks of this and related species, when freshly dug up, have a pleasant clove-like aroma. The rootstock was once used as a moth repellent and to flavour ale. They have also long been used to treat chest diseases. The alternative common name, Herb Bennet, may be a corruption of *herba benedicta* (blessed herb) because the plant was believed to be a powerful charm against evil spirits. Or the plant may have once been called 'St. Benedict's herb' in memory of the saint who founded the Benedictine order of monks. The plant is still used in herbalism and homeopathy, but rarely if ever in conventional medicine.



Geum urbantum

Uses

The rhizomes are used medicinally. Their constituents include tannins, bitter compounds, an essential oil with gein and eugenol, and organic pigments (leucoanthocyanins). These substances give Wood Avens astringent, antiseptic, tonic, antiinflammatory and antidiarrhoeal properties. It is used as a powder or decoction to treat gastritis and enteritis, intestinal colic, liver disorders and to check internal bleeding. Externally Wood Avens is used in gargles for stomatitis, gingivitis and other mouth inflammations and bad breath (halitosis), and in compresses and bath preparations for skin disorders and haemorrhoids.

Glechoma hederacea

(Family: Labiatae/Lamiaceae)

Vernacular Name

Eng.–Ground Ivy.

Botanical Description

A perennial herb with a long creeping, rooting rhizome and ascending or erect flowering stems. The opposite leaves are rounded, cordate to reniform, long-stalked and crenate, and are quite different

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from those of true Ivy (*Hedera helix*). The large blue-violet flowers grow in groups of two to four in loose whorls at the base of the leaves, usually on the same side of the stem. The flower has a straight corolla tube and two notched lips, the lower lip with darker markings. The fruit consists of four one-seeded nutlets.

Habitat

Ground Ivy grows throughout most of Europe in grassland, thickets, woods and waste places, especially on damp heavy soils. It is common in most parts of the British Isles, but rare in northern Scotland. The generic name, *Glechoma*, is derived from the Greek word *glaukos* (= grey green), a reference to the leaf colour. The specific epithet, *hederacea*, refers to the ivy-like creeping habit of the plant–but on the ground, not on trees. Ground Ivy has long been used as a medicinal herb, primarily for fever, coughs and sore eyes. The faintly mint-scented leaves were also used in brewing to clear and sharpen the flavour of ale, or gill. The plant is still used in herbalism and homeopathic medicine.

Uses

The flowering stems are used medicinally. The constituents include the bitter compound glechomine, an essential oil, tannins (6-7 per cent), saponin and potassium salts. These substances give Ground Ivy astringent, anti-inflammatory and tonic properties and an infusion is used for gastritis, enteritis and diarrhoea, for kidney disorders, bronchial catarrhs, coughs and some asthmatic conditions. It also stimulates the appetite and is a general tonic. Homeopathic tinctures are prepared from fresh plant parts. Externally Ground Ivy is used in gargles for mouth infections, and in compresses and bath preparations for skin disorders.

The fresh shoots and leaves can be added to salads and soups or prepared and eaten like spinach.

Glinus oppositifolius

(Family: Molluginaceae)

Botanical Description

Prostrate or diffuse herb; leaves in whorls of 3-5, oblong-oblanceolate, acute, unequal, 0.5–3 × 0.2–0.6 cm, glabrescent; flowers small, white, fascicled in the axils; sepals 5, free, elliptic-obtuse; petals 0; stamens 5, alternating with sepals; staminodes 2-fid; ovary 2 lobed, many ovuled, styles 3; capsules 3 valved; seeds dark brown, reniform.

Habitat

Pantropical weed, common in moist shady places throughout India.

Uses

The drug forms an ingredient of preparations like *Arukaladi tailam, Kaccoradi oil, Valiya marmagulika*, etc. The whole plant is medicinal and is reported to be cooling, sour, blood purifier and alleviative of *kapha* and *pitta*. The seeds are diuretic and anthelmintic. The drug cures wounds, flatulence, cough, bronchitis, dysphonia and diabetes. It is also useful in eye diseases, inflammation of the bladder and kidney, fever, *raktapitta*, piles, burning sensation of the body, and thirst.

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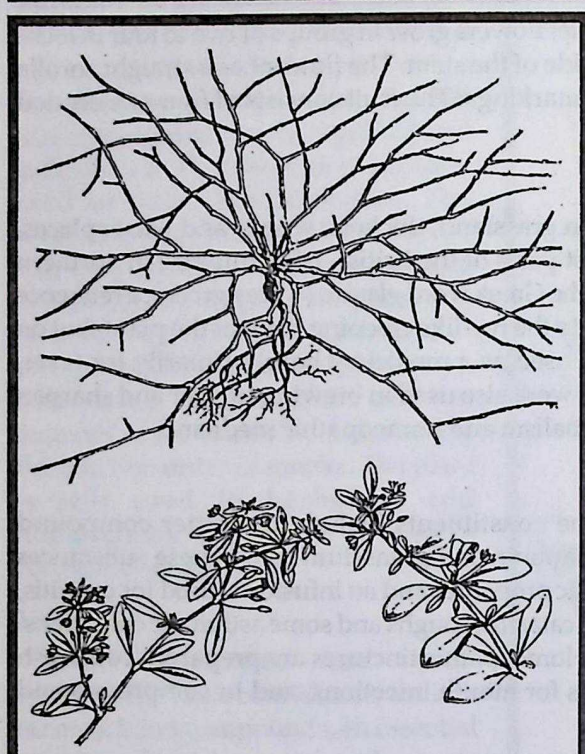

Glinus oppositifolius

Gloriosa superba

Gloriosa superba, Linn.

(Family: Liliaceae)

Vernacular Names

Sans.–Sukra Pushpika, Garbhagatini, Langalika, Agni-sikha, Kalikari; *Eng.*–Superb Lily; *Hind.*–Kalihari, Kariari, Karihari, Languli, Carrihari; *Ben.*–Bishalanguli, Ulatchandal, Bisha; *Bom.*–Indai; *Duk.*–Nat-ka-bachnack; *Mah.*–Nagakaria, Karianag; *Guj.*–Khadyanag; *Pers.*–Buch-nak-hindi; *Punj.*–Mulim, Kariari; *Tel.*–Adavinabhi, Agnisikha, Kalappa-gadda, Pottidumpa; *Tam.*–Kalaippaikizhangu, Kartikkai-kizbangu; *Mal.*–Manthori-kizhangu, Macttoennui, Kandal, Ventoni; *Can.*–Nangulika; *Kon.*–Vaganankṭa.

Habitat

This elegant climbing plant is common in Bengal and in low jungles throughout India, Burma and Ceylon.

Parts Used

Tubers (roots).

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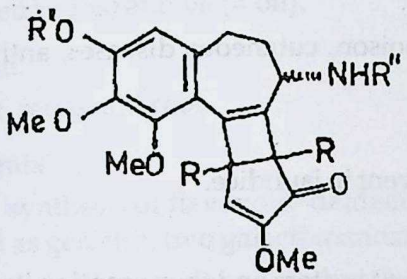
Constituents

Two resins, tannin and a bitter principle (alkaloid) *superbine* allied to the bitter principle of squill, and alkaloid *gloriosine*. A white farlinaceous starch is obtained from the root by repeated washing, and grindings throwing away the supernatent liquid and washing the residue carefully six times.

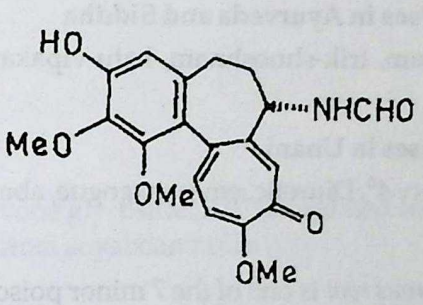
Colchicine and related alkaloids identified in bulbs and seeds by PC; new alkaloids –O^2-demethyl-N-formyldeacetylcolchicine, N-formyldeacetyl-β-lumicolchicine, O^2-demethyl-N-formyldeacetyl-β-lumicolchicine, O^2-demethyl-β-lumicolchicine, N-formyldeacetyl-γ-lumicolchicine isolated.

New Compounds



N-formyldeacetyl-β-lumicolchicine

R = β-H, R' = Me, R'' = CHO



O^2-demethyl-N-formyldeacetylcolchicine

O^2-Demethyl-N-formyldeacetyl-β-lumicolchicine

R = β-H, R' = H, R'' = CHO

O^2-Demethyl-β-lumicolchicine

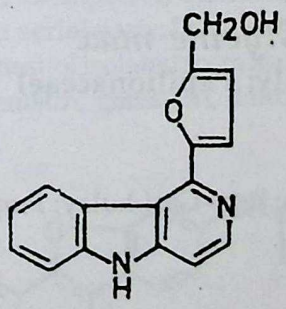
R = β-H, R' = H, R'' = CHO

N-formyldeacetyl-γ-lumicolchicine

R = α-H, R' = Me, R'' = CHO

β-Sitosterol, its glucoside and 2-hydroxy-6-methoxybenzoic and isolated from rhizomes; a new alkaloid isoperlolyrine–isolated from seeds along with cornigerine, (S)(+)floramultine (bechuanine,1,12-dihydroxy-2,10,11-trimethoxyhomoaporphine, colchicamide, 2-demethyl-colchifoline, demethylcolchifoline and colchicoside; structure of isoperlolyrine determined.

New Compounds



Isoperlolyrine

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Biological Activity

Colchicine (2, 4 and 5 mg) when infused into udder of goats decreased milk production. In some animals mammary gland blood flow was increased from 8th to 24th hr after infusion which returned to normal after 4 days of infusion.

Action

Root is a tonic, antiperiodic, cholagogue, alterative and purgative. According to the *Nighantus*, root is purgative, hot, light and pungent; it increases secretion of bile. Tubers are very bitter to taste. Contrary to popular belief, root is not poisonous in ordinary doses.

Action and Uses in Ayurveda and Siddha

Katu rasam, trik-shnoshnam, katu vipakam, snake poison, cutaneous diseases, anthelmintic, abortive.

Action and Uses in Unani

Hot 4°, Dry 4°, Diuretic, emmenagogue, abortive, resolvent in jaundice.

Uses

The *Tuberous root* is one of the 7 minor poisons of Sanskrit writers and they mention its use as an abortifacient. A paste of the root formed with water is used as an anodyne application in bites of poisonous insects, snake-bites, scorpion-sting, parasitic skin diseases and leprosy. Root in thin slices soaked in salted butter-milk for 4 to 5 days by might and dried by day for 4 to 5 days is said to be freed from its poisonous properties. So prepared and preserved, a piece or two given internally for cobra bite is said to be an effectual antidote against cobra-poison. White powder obtained by repeated washings and grindings is given in gonorrhoea up to 12 grains mixed with honey. Dose of the tuberous root (starch) is 5 to 10 grains. It is generally employed as an anthelmintic for cattle. In large doses it will be poisonous. Root powdered and reduced to a paste is applied to the navel and suprapubic region with the object of promoting labour pains. For the same purpose the paste may be applied to the palms and soles also. In cases of retained placenta, paste of root is applied to palms and soles while powdered nigella seeds and long-pepper are given internally with wine. *Internally* starch or root is useful when given in gonorrhoea, leprosy, piles, colic, and to expel intestinal worms. Rubbed with *Chitraka* bark in cow's urine it is applied to painful piles.

Glycine max
(Family: Papilionaceae)

Vernacular Names

Eng.–Soyabean; *Hind.*–Bhat, Bhatwan; *Ben.*–Gari-kulay; *Punj. & Kumaon*–Bhut; Eastern Terai–Khajuwa.

Botanical Description

A cultivated annual herb with an erect hairy stem and large trifoliate leaves. The white to violet-tinged flowers grow in clusters from the leaf axils. The fruit is a slightly curved and hairy pod with variously coloured seeds depending on the variety.

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Habitat

Met with on the tropical Himalayas from Kumaon to Sikkim, and Khassia and Naga Hills.

Soybean is native to Eastern Asia where the wild form still grows. It was not known in Europe until the 17th century but has been cultivated since ancient times in China, Korea and Japan. It is now grown on a large scale in Europe and America for the seeds, which are an important source of edible oil and flour. It ripens with certainty only in warm regions where grapes and maize thrive and for this reason it is not grown on a commercial scale in Britain. The generic name, *Glycine*, is derived from the Greek word *glykys* (= sweet), a reference to the sweet taste of the beans of some species in the genus. The word 'soy' has come to us through Dutch and Japanese words from the Chinese *shi-yu*, from *shi* (= salted beans) and *yu* (= oil).

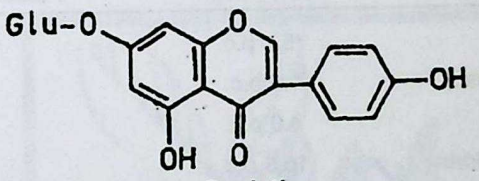
Parts Used

Plant, seeds and root.

Constituents

New synthesis of flavonoid–daidzein; an isoflavone glycoside (0.01%) isolated from roots and identified as genistin; two galactomannans isolated from soyabean hulls.

New Compounds

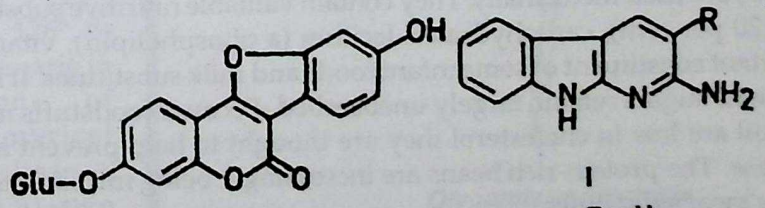


Genistin

Crude saponins inhibited elevation of serum transaminase produced by oral administration of peroxidised corn oil to rats. Saponin, thus, inhibited lipid peroxidation in liver. Crude saponins also decreased serum cholesterol and triglycerides.

A new isoflavone glucoside–6″-O-acetylgenistin–isolated; amino-2-carboline derivatives (I) and (II) isolated from soyabean casein; soyasaponins I, II, III, A1 and A2 isolated; ceramides and cerebrosides isolated from seeds and chemically examined; (+)pinitol, myo-inositol, fructose, glucose isolated from stems; revised structures of soyasapogenols A, B and E by X-ray analysis; ciceritol detected in cotyledons of soyabean; hypoglycaemic complex from aerial part contained allantoin and 17 amino acids; formononetin, daidzein, genistein, kaempferol, quercetin and chlorogenic, neochlorogenic, ferulic and p-coumaric acids isolated from aerial parts; D(+)ononitol (4-O-methyl-myo-inositol), sequoyitol (5-O-methyl-myo-inositol) and bornesitol isolated from leaves; coumestrin isolated from roots together with its aglycone (coumestrol), genistin, genistein, daidzin and daidzein; structure of coumestrin determined.

New Compounds



Coumestrin

I
R = H
II
R = Me

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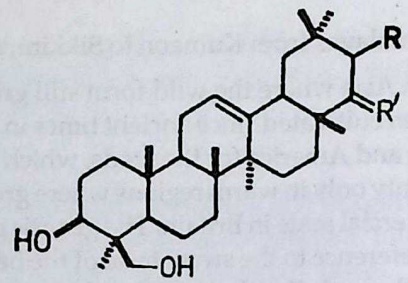

Soyasapogenol A
R = β-OH,R' = β-OH,H
Soyasapogenol B
R = H,R' = β-OH,H
Soyasapogenol E
R = H,R' = O

The average composition is given as follows, with the percentage of digestibility–

	Composition	*Percentage of Digestibility*
Moisture	75.1 p.c.	
Ether Extract (fat, etc.)	1.0 p.c.	55 p.c.
Proteids	4.0 p.c.	78 p.c.
Digestible carbohydrates	10.6 p.c.	77 p.c.
Fibre	6.7 p.c.	45 p.c.
Ash	2.6 p.c.	
	100.0 p.c.	

Biological Activity

Amino-2-carboline derivatives (I, II) showed mutagenic activity of 160 and 102 color at 1μg/plate respectively as against 98 colonies with benz[a]pyrene against *Salmone typhimurium*; soyasaponins I and II inhibited adrenaline–induced lipolysis in fat cells, whereas ACTH-induced lipoly was inhibited by soyasaponins I, II and III. Soyasaponins I and A2 increased triglycerin synthesis from glucose in adipose tissue slices in presence of low concentration of insulin, by this synthesis was inhibited by soyasaponins II, III, A1 and A2 in presence of high concentration of insulin; cerebrosides from seeds showed 74% protection against stress-induced ulcer in mice.

Uses

The seeds (beans) are used medicinally. They contain valuable nutritive substances –proteins (40 per cent), fatty oil (20 per cent), carbohydrates, lecithin (a phospholipid), vitamins and minerals. Soybean is an important constituent of some infant foods and milk substitutes. It is also an ideal food for diabetics because its sugars remain largely unabsorbed. Because foodstuffs made from Soybean flour and Soybean oil are low in cholesterol they are thought to help prevent arteriosclerosis and coronary heart disease. The protein-rich beans are increasingly being mixed with meat products or used on their own as meat substitutes.

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The expressed oil from the beans is used to make plastics and many other products. It is an important cooking oil and is used as a major raw material of margerine. Fermented beans are used to make oriental sauces and pastes and the well-known Worcester Sauce in Britain. Blanched Soybean seedlings are a popular salad vegetable.

Glycomis pentaphylla, Correa.

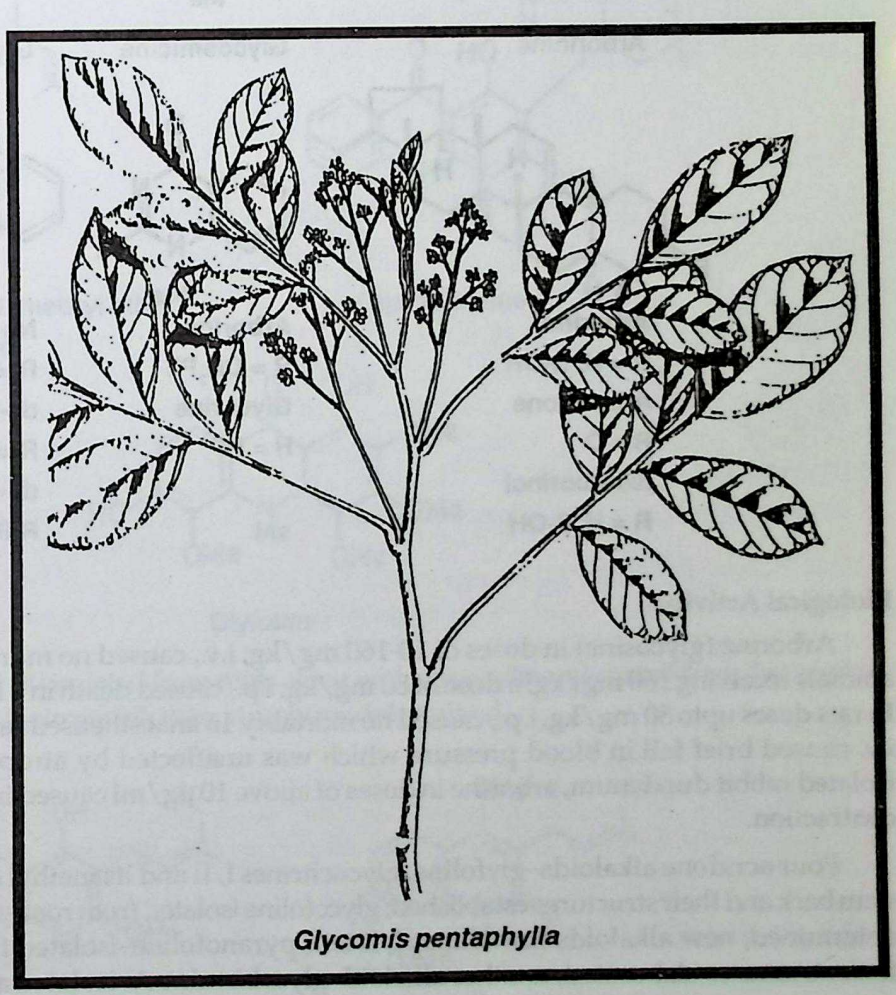
(Family: Rutaceae)

Vernacular Names

Sans.–Vanamimbuka; *Hind.*–Ban-nimbu; *Ben.*–Ash-shoura; *Bom.*–Kirmira; *Tam.*–Gonji.

Botanical Description

Shrub or small tree; leaves alternate, imparipinnate; leaflets 3-5, aromatic, obovate or oblanceolate-obtuse, to 18 × 7 cms, base cuneate, margin entire to crenulate; flowers small, white in axillary speciform panicles; sepals 5, ovate-rotund, margins scarious, ciliate; petals obovate-elliptic, glandular; disc obscurely lobulate; stamens 8-10, free, inserted round a disc, filaments flat, anthers ovate to elliptic-cordate with 1 prominent dorsal gland on the connective; ovary 2-5 celled, coarsely pustulate, style short, stigma flat, obscurely angled; fruit 1-3 seeded, white or pink subglobose berry.



Glycomis pentaphylla

Habitat

The plant is seen in all districts in India as forest undergrowths. Also known from Sri Lanka, S.E Asia & W. Malaysia.

Constituents

Presence of dictamnine, γ-fagarine, m.p. 142°, skimmianine, m.p. 176°, β-sitosterol and a coumarin in roots; isolation of stigmasterol, myricyl alcohol, a new base – glyborine (0.004%)–two new triterpenes–arborinol

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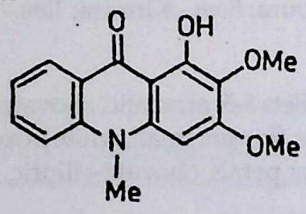
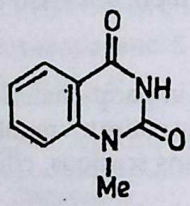
A, m.p. 270°, (0.022%) and arborinol B (0.003%); structure of arborine (glycosine) elucidated as 2-benzyl-1-methyl-4-quinazolone; structure of arborinine (0.1%), m.p. 176°, confirmed as 2,3- dimethoxy-1-hydroxy-10-methylacridone; three new quinazolone bases–glycosminine (glycosmine), m.p. 249°, glycorine HCl, m.p. 242°, glycosmicine, m.p. 265°–and also γ-fagarine and skimmianine isolated from leaves and their structures described; two new epimeric pentacyclic triterpenes–arborinol, m.p. 274° and isoarborinol, m.p. 294°–isolated from leaves and their structures determined; structures of glycosmicine, glycorine and glycosminine elucidated; complete structure of arborinol by X-ray crystallography; three new acridone alkaloids–noracroaycine, de-N-methylacronycine and de-N-methylnoracronycine–from root bark; arborinone, m.p. 216° (0.00028%), along with arborinol and isoarborinol from leaves; interrelationships among quinazolone alkaloids; demethylation of glycorine and arborine to 4-quinazolone and glycosminine respectively.

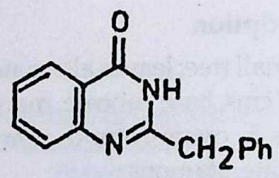
New Compounds



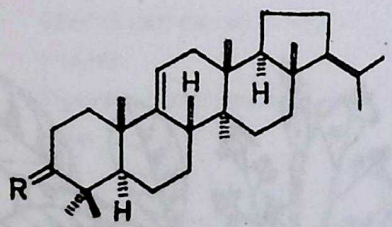
Arborinine



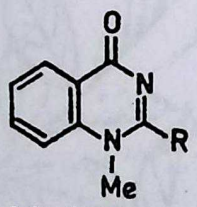
Glycosmicine



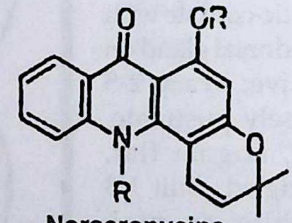
Glycosminine



Arborinol
R = H, α-OH
Arborinone
R = O
Isoarborinol
R = H, β-OH



Arborine
R = CH_2Ph
Glycorine
R = H



Noracronycine
R = Me, R' = H
de-N-Methylacronycine
R = H, R' = Me
de-N-Methylnoracronycine
R,R' = H

Biological Activity

Arborine (glycosine) in doses of 10-160 mg/kg, i.v., caused no mortality in mice except in 1 of 3 animals receiving 160 mg/kg; a dose of 80 mg/kg, i.p., caused death in 1 mouse and tremor in another. In rats doses upto 80 mg/kg, i.p., caused no mortality. In anaesthetised rats *in situ*, doses of 1-4 mg/kg, i.v. caused brief fall in blood pressure which was unaffected by atropine and/or mepyramine. In isolated rabbit duodenum, arborine in doses of above 10 μg/ml caused increased peristalsis and mild contraction.

Four acridone alkaloids–glyfoline, glycocitrines I, II and its methyl ether–isolated from root and stem bark and their structures established; glycofoline isolated from root and stem bark and its structure determined; new alkaloids furofolines I, II and pyranofoline–isolated from root and stem bark and their structures elaborated; another alkaloid–glycobismine A–isolated and characterised.

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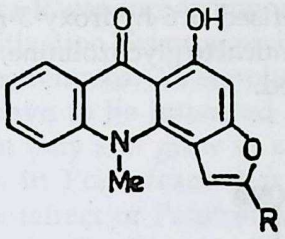
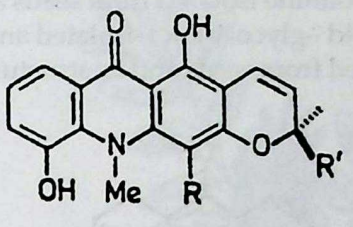
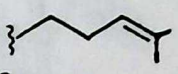
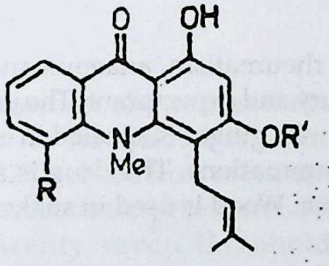
New Compounds



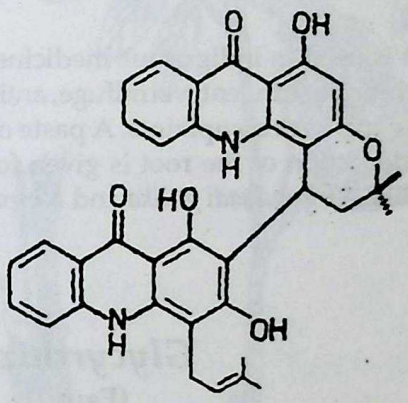
Furofoline I
R = H
Furofoline II
R = CMe_2OH



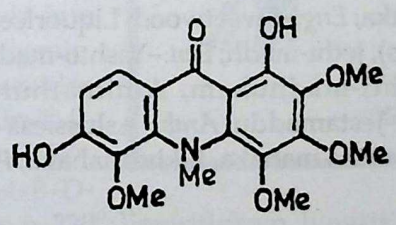
Glycofoline
R = H, R' = 
Pyranofoline
R = OMe, R'= Me



Glycocitrine I
R = OH, R' Me
Glycocitrine II
R,R' = H
Glycocitrine II methyl ether
R = H, R' = Me



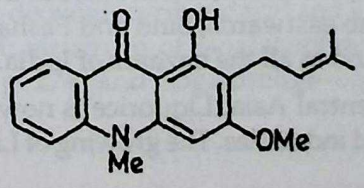
Glycobismine A



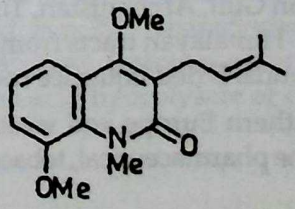
Glyfoline

Two new alkaloids (I) and (II) isolated from roots along with glycozoline, glycozolidine, dictamnine, skimmianine, arborinine and β-sitosterol; their structures determined.

New Compounds



I



II

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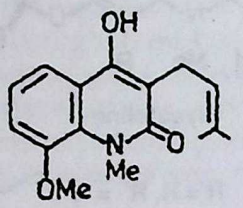
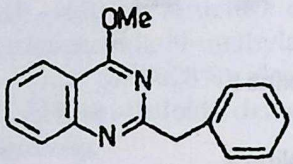
Glycophymoline isolated and its structure established; glycosolone isolated from root bark and characterised glycozolinine isolated from seeds and characterised as 6-hydroxy-3-methylcarbazole methyl; a new alkaloid –glycozolinol–isolated and found identical to glycozolinine; a new alkaloid–glycophylone–isolated from seeds and its structure determined.

New Compounds



Glycophylone



Glycophymoline

Uses

The plant is used in indigenous medicine for cough, rheumatism, anaemia and jaundice. The whole plant is bitter, astringent, vermifuge, anti-inflammatory and expectorant. The juice of the leaves is used in fever and liver complaints. A paste of the leaves with ginger is applied in eczema and skin affections. A decoction of the root is given for facial inflammations. The drug is a component of preparations like *Nirgundyadi gulika* and *Nirgundyadi ghrtam*. Wood is used in snake-bite.

Glycyrrhiza glabra, Linn.

(Family: *Papiiionaceae*)

Vernacular Names

Sans.–Yashti-madhu, Madhuka; *Eng.*–Sweetwood, Liquorice; *Hind.*–Mithilakdi (root), Mulathee, Kubas-susa (extract in black sticks), Jethi-madh; *Ben.*–Yashto-madhu; Guj. & *Mah.*–Jashtimadh; *Ben. & Bom.*–Jashti-madhu; *Tel.*–Yashti-madhukam, Athimathuram; *Tam.*–Ati-maduram (root), Athimathurappal (extract); *Can.*– Jestamaddu; *Arab.*–Aslussiesa (root), Asla-soos (root), Rubussusa, Rubhae-soos (extract); *Pers.*–Ausareha mahaka, Bikhe mahaka; *Fr.*–Bois doux; *Ger.*–Sussholz.

Botanical Description

A perennial herb with a woody, creeping rhizome, an erect, branched stem and alternate, odd-pinnate leaves with 9-17 elliptic to oblong leaflets. The blue-violet flowers are arranged in long-stalked axillary spikes. The fruit is a smooth reddish brown pod.

Habitat

Arabia, Persian Gulf, Afghanistan, Turkestan, Asia-Minor, Siberia etc., but the root is cultivated in the Punjab, Sub-Himalayan tracts from the Chenab eastwards, Sind and Peshawar Valley, Burma and Andaman Islands. Dried liquorice roots are found in all the bazaars of India.

Native to southern Europe and western and central Asia. Liquorice is now widely cultivated commercially for the pharmaceutical, tobacco and food industries. The growing of Liquorice in England

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began in the 16th century in the Pontefract district of Yorkshire. It was once an important crop there but cultivation has progressively declined and none remains. All supplies of Liquorice now have to be imported into Britain. The plant may still grow in some gardens. It was in Pontefract that the confectionery Pontefract or Pomfret cakes were originally made. The medicinal properties of the plant were known to the ancient Assyrians and Egyptians. The herb remains a popular remedy.

Glycyrrhiza glabra

Parts Used

Peeled root

Constituents

Alkaloidal fraction showed antiulcer activity in rats. A flavanone rhamnoglucoside, m.p. 132°, isolated from roots; used as smooth muscle relaxant in pharmaceutical composition; twenty seven flavonoids present in roots; of these six isolated and three identified as 4′,7-dihydroxyflavanone (liquiritigenin), its 4′-β-D-glucoside (liquiritin) and 2, trihydroxychalcone (isoliquiritigenin); other three are new flavonoids,–L-1, m.p. 164°, L-2 m.p. 150°, L-7, m.p. 142° aglycones (90%) obtained by hydrolysis of flavonoid L-1, separated into liquiritigenin, m.p. 207° and isoliquiritigenin, m.p. 198°; two new chalcone glucosides characterised as trans-isoliquiritigenin-4′-β-glucopyranoside (isoliquiritin), m.p. 187°, and trans-isoliquiritigenin-4-β-D-glucopyranoside (neoisoliquiritin), m.p. 230°; liquiritigenin, liquiritin and isoliquiritigenin detected by PC; 7-hydroxy-4′-methoxyisoflavone (formonetin) from roots; a new flavonoid glycoside–licuraside, m.p. 150°–characterised as trans-isoliquiritigenin-4-O-(-O-β-D-glucopyranosyl-2-β-D-apiofuranoside); ten flavonoids identified plant by PC and saponaretin (isovitexin) characterised; isolation and structure of new flavonone glycoside–rhamnoliquiritin.

A new triterpenoid–liquoric acid–isolated from roots, its structure elucidated; isolation of two triterpenoid acids-11-deoxoglycyrrhetic acid and liquiritic acid, m.p. 298°, characterised as C-20 epimer of glycyrrhetic acid; structure of isoglabrolide, m.p. 318°; new lactones–glabrolide, m.p. 360° deoxoglabrolide, m.p. 274° and isoglabrolige–obtained from acid hydrolysate of crude glucosides;

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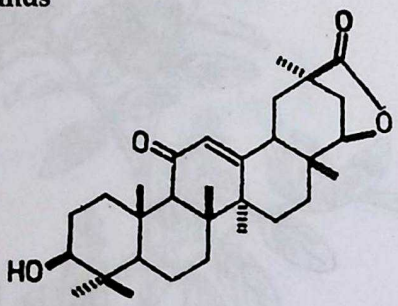
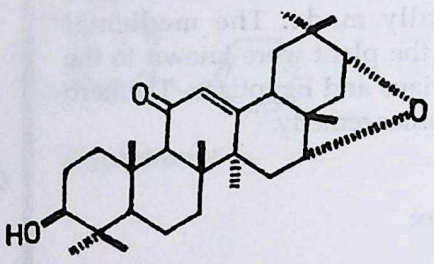
glycyrrhizic acid isolated from rhizomes and roots; isolation of glycyrrhetol, m.p. 304° and 21α-hydroxy-isoglabrolide and their structures elucidated; synthesis of glycyrrhizic acid derivatives; 18α-hydroxyglycyrrhetic acid isolated from acid fraction of plant extract; 24-hydroxy-11-deoxyglycyrrhetic and 24-hydroxyglycyrrhetic acids isolated as their Me esters; structures of 24-hydroxyliquiritic and liquiridiolic acid determined; preparation of Me glabrate from Me glycyrrhetate.

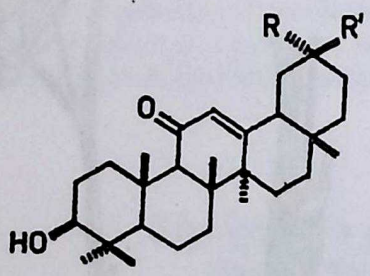
New Compounds



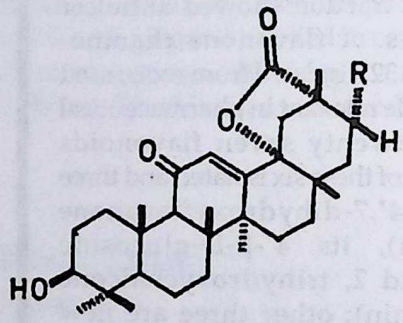
Glabrolide



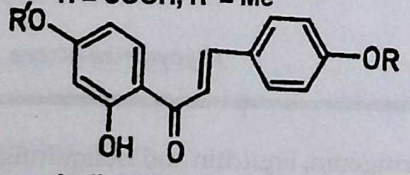
Liquoric acid



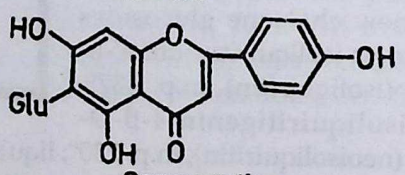
Glycyrrhetol
R = Me, R' = CH_2OH
Liquiritic acid
R = COOH, R' = Me



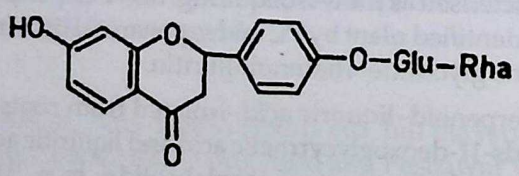
Isoglabrolide
R = H
21α-Hydroxyisoglabrolide
R = OH



Isoliquirigenin
R,R' = H
Isoliquiritin
R = H, R' = Glu
Neoisoliquiritin
R = Glu, R' = H



Saponaretin



Rhamnoliquiritin

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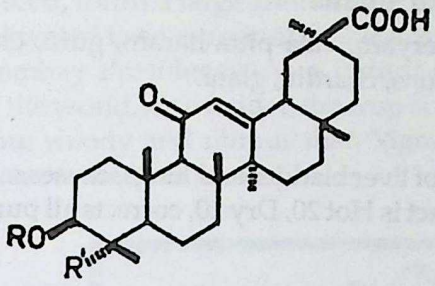

Glycyrrhetic acid
R = H, R' = Me,18α-H
24-Hydroxyglycyrrhetic acid
R = H, R' = CH_2OH, 18α-H
Glycyrrhetinic acid
R = H, R' = Me,18β-H
Glycyrrhizic acid
R = Gluc.acid(2→1)Glu, R' = Me,18β-H

Root contains Glycyrrhizin, a yellow amorphous powder, asparagin, sugar, starch, acid resin, gum, mucilage, phosphoric, sulphuric and malic acids, caldium and magnesium salts. Bark contains a small quantity of tannin.

Biological Activity

A therapeutically active substance from roots lowered the blood pressure and roused rats in barbiturate narcosis.

Spasmolytic activity of glycyrrhizin (8%) was 1/500 that of papaverine; glycyrrhizin showed significant antidiuretic effect in rats and rabbits, i.p. or orally, but crude plant extract did not show significant effect in human volunteers even in high doses (20 g); a flavanone rhamnoglucoside used as a depressor of smooth muscle fibres in pharmaceutical compositions; LD_{50} s.c. of glycyrrhizin and glycyrrhizin-thiamine HCl in rats was 1.94 and 0.764 g/kg respectively. Both substances when pre-administered in doses of 0.3-0.1 mg/kg significantly prolonged survival time of rats which had received a lethal dose of strychnine, shikimin, toxopyrimidine, nicotine, caffeine or arsenobenzene; three flavonoids isolated, one was highly estrogenic while other two were nonestrogenic.

Flavanoids–liquiritigenin, its glucoside, licurzid and liquiritone–administered internally to cats in X-ray experiments, inhibited passage of Ba suspension from stomach into intestine. In dogs, they inhibited evacuation of water from stomach into duodenum.

General Analysis

Moisture 5.25, ether extract 16.85, albuminoids 37.00 (containing nitrogen 5.92), soluble carbohydrates 31.00, woody fibre 6.05 and ash 4.80 (containing sand 0.25) per cent respectively.

Action

Tonic, cooling, demulcent, expectorant, diuretic, emmenagogue and gentle laxative.

Decoction of the root possesses astringent properties.

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Action and Uses in Ayurveda and Siddha

Madhura rasam, seetha-veeryam, vata-pitta-haram, guru, chakshusyam, swaryam, kesyam, balavarna karam. In ulcers, poisons, chardhi, glani.

Action and Uses in Unani

Hot 20°, Dry 10°. In diseases of liver bladder and lungs, causes nuzj in viscid, akhlath, expectorant, nerve tonic, enmenagogue. Extract is Hot 20, Dry 20, corrects all purgatives, haemoptysis.

Uses

Root is also used is scorpion-sting. Root in *infusion, decoction, extract* or *lozenge* is useful as a demulcent in inflammatory affection or irritable conditions of the bronchial tubes, bowels and catarrh of the genito-urinuy passages as cough, hoarseness, sore-throat, asthma, dysuria, ardor urinae, etc., also used as a tonic and as a slight laxative. It is much used as an adjunct in pharmaceutical preparations as compound decoction and tincture of aloes, compound mixture and confection of senna etc., also used for flavouring infusions, lozenges, oils and *ghritas. Liquid extract* is especially useful in disguising the bitter or acrid taste of many nauseous drugs, particularly senna (leaves), aloes, chloride of ammonium, senega, hyocyamus, turpentine, etc. and to sweeten tobacco. Inspissated juice sold in the bazaars in the form of black pencils is an ingredient of various laxative powders, cough syrups, confections, lozenges, pastilles etc. Root mixed with lime juice and linseed makes a homely valuable remedy for coughs and colds, feverishness, pain, distress of breathing and to allay thirst. Dr. Geo. S. Keith has stated that for relieving pain, discomfort and other symptoms caused by acrid matter in the stomach, it is wonderful. It seems to remove the irritating effects of acids in a better way than alkalies. Root is one of the ingredients of several cooling applications, along with sandal wood, madder, Andropogon muricatus etc. The compound powder which consist of liquorice root and fennel fruit each 1 part, senna 2 parts, sublimed sulphur 6 parts and refined sugar all powdered and mixed together, is useful as a gentle laxative, given to delicate patients. Following *compound powder* is useful in controlling the pyrexia of phthisis: Take of liquorice root, Cydonia vulgaris seeds, and Andropogon muricatus each 7 *mashas* (*masha* 16 grains), camphor, saffron, cinnamon bark, seeds of Cassia fistula, seeds of Lettuce seeds, sandal, Rose petal and seed of water-melon each 3 *mashas* and gum tragacanth 1½ *mashas;* powder them and mix together; *dose*: 4 to 6 *mashas* (about 1 to 1½ drachms). A decoction made of the liquorice root, coriander seeds, Cyperus rotundus and *gulancha* in equal quantities is a useful remedy for bilious fevers. A *confection* called *Majoonai Soul*, is a very useful expectorant in bronchitis, also useful in malaria and will reduce an enlarged spleen by long continued use. It is made thus: Take of 8 tolas of liquorice root, 48 tolas of preserved grapes, 32 tolas of white sugar, and 2 tolas each of chebulic and beleric myrobalans, cloves, nutmeg, round zedoary and cinnamon and half drachm each of anisi fruit, emblic myrobalan and Anethum sowa; make a decoction of the liquorice root, powder all the other ingredients and make confection with sugar and preserved grapes; dose is ¼ to 1 tola twice a day. A mixture containing extracted juice of liquorice roots and extracted juice of Hermaphrodite amaranth taken with honey is a sovereign cure for all sorts of leucorrhoea and other uterine complaints. Lozenges made up of extract of liquorice root 3 parts, and 1 part each of cubebs, gum arabic, and extract of conium, and 4½ parts of sugar, all powdered, mixed together and made into troches or pastilles are useful in bronchial affections. Compound pills made up of extract liquorice 10 parts, acacia gum 8, black pepper 6, pellitory root 4, *gluancha* 6, saffron 12 and sugar 10 parts, are useful in cough and asthma, and pills of 5 grains each, compound of equal parts of liquorice, camphor, asafoetida and gum acacia are useful for influenza. Chinese pharmacy ascribed the property of rejuenvating those who consume liquorice for long periods.

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Glycine Soja, as grown for seed, forms a large annual crop in Northern China, Manchuria and Japan, while the plant is also cultivated to a very considerable extent in the hills of North-East India and Government Farms of Bombay Presidency. As a fodder-crop this has been utilised and recommended in many parts of the world. As a fodder, the crop is richer in proteids than most other leguminous crops, but it is more woody and fibrous than Vigna catiang (*chavli*), and hence less palatable to stock, while there is more waste in feeding.

Gmelina arborea, Linn.
(Family: Verbenaceae)

Gmelina arborea

Vernacular Names

Sans.–Gambhari, Krishna Vrinlaka, Shriparni, Kasmari; *Hind.*–Gambharag, Kumbhar, Gumbhar, Kambari; *Ben.*–Gamari, Gaenari, Gumar, Gumbar; *Guj.*–Shewan; *Mah.*–Shivanasal; *Bom.*–Shewun; *Punj.*–Kumhar, Gumhar; *Tel.*–Gumar-tek; Peddagomru; *Tam.*–Gumuadu-teku, Gumadi; *Mal.*–Kumbula; *Can.*–Kashmiri-mara, Shivanni-gida; *Santal.*–Kasmar; *Burm.*–Yamanai.

Habitat

The lower Himalayas, the Nilgiris and the East and West Coasts of India.

Parts Used

Root, bark, fruit and leaves. (Root and fruit are preferable).

Constituents

Root contains a yellow viscid oil, resin, an alkaloid, a trace of benzoic acid and ash free from manganese. Fruit contains butyric and tartaric acids, an alkaloid, saccharine matter, resin and a trace of tannin.

Action

Demulcent, stomachic, bitter, tonic, refrigerant and laxative. Tender leaves are demulcent. Fruit is sweetish-bitter and cooling. Extract of root is bitter and tonic.

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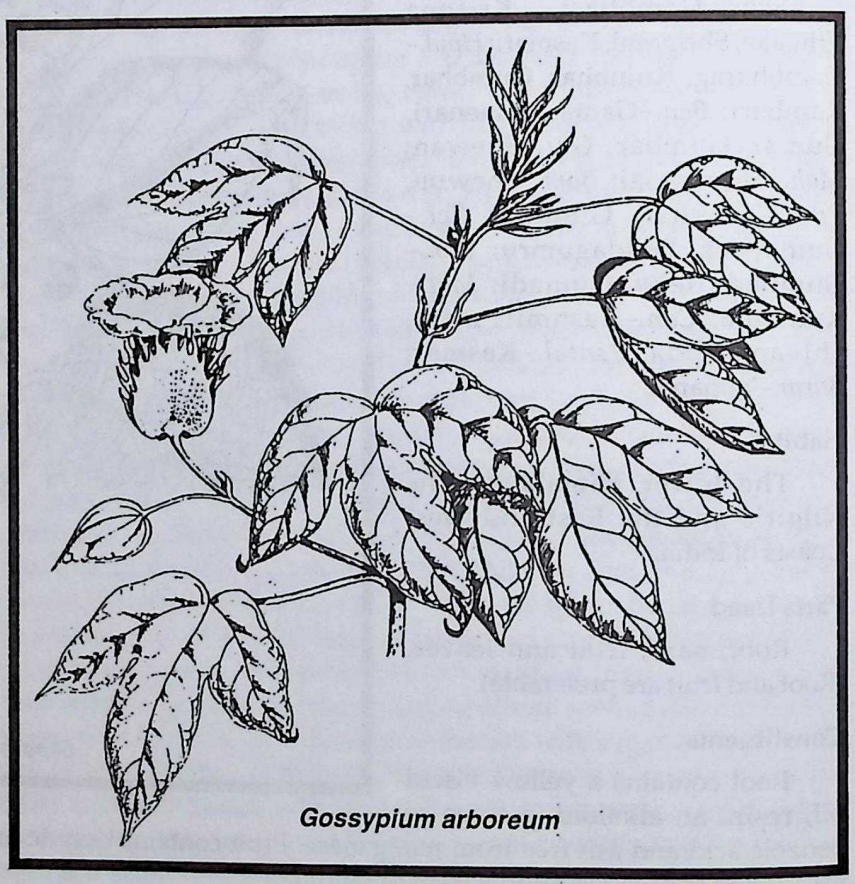
Uses

The drug is used in snake-bite and scorpion-sting. *Root* is an ingredient of the *dasamula* of the Vaidyas. It is used in the form of *infusion* or *decoction* in fever, in indigestion, anasarca, etc. With liquorice, sugar and honey added it is given as a galactagogue in cases of scanty secretion of milk in women. *Juice of tender leaves* added to cow's milk and sweetened with sugar-candy is given with much benefit in gonorrhoea and catarrh of the bladder. An *infusion* of the tender leaves is also useful. Leaves ground into paste with water is applied to the forehead for headache in fevers. To prevent abortions in the early stage of pregnancy a *powder of the bark* of black gingelly seeds, *manjista* and *satavari* is given in milk. *Fruit* forms an ingredient of several cooling and refrigerant decoctions, e.g. (1) Take of the fruits of Gmelina arborea, Grewia asiatica, liquorice root, red sandal wood and root of Andropogon muricatus, equal parts in all two tolas (water 32 tolas, and boil till) reduced to one-half. This decoction is used as a drink in bilious fever-(Chakradatta). (2) Take of the fruit of Gmelina arborea 10, Raisins 10, Indian Sarsaparilla 6, Delphinium saniculaefolium 5, and Cocculus cordifolius 8 parts. Mix and make a decoction. When ready add jaggery 2 parts. Dose-1 to 1½ ounces. This is used in remittent fever.

Gossypium arboreum
(Family: Malvaceae)



Gossypium arboreum

Botanical Description

Erect shrub, leaves simple, alternate, long-petioled, broad-ovate-cordate, deeply palmately 3-5 lobed, glabrescent; lobes linear oblong to oblong-lanceolate, mucronate, under surface punctate with black dots; flowers large, reddish with darket centre or rarely yellowish, axillary, solitary, bracteoles 3, large, foliaceous, ovate-cordate, laciniate, punctate, calyx truncate, punctate; corolla of five free spreading petals, adnate at base to the base of the staminal column; stamens many, monadelphous; ovary 3-celled; fruit a loculicidal capsule, seeds covered with white cotton fibres.

Habitat

The plant is found throughout the greater part of India in the plains districts. It is at times cultivated as an ornamental in gardens.

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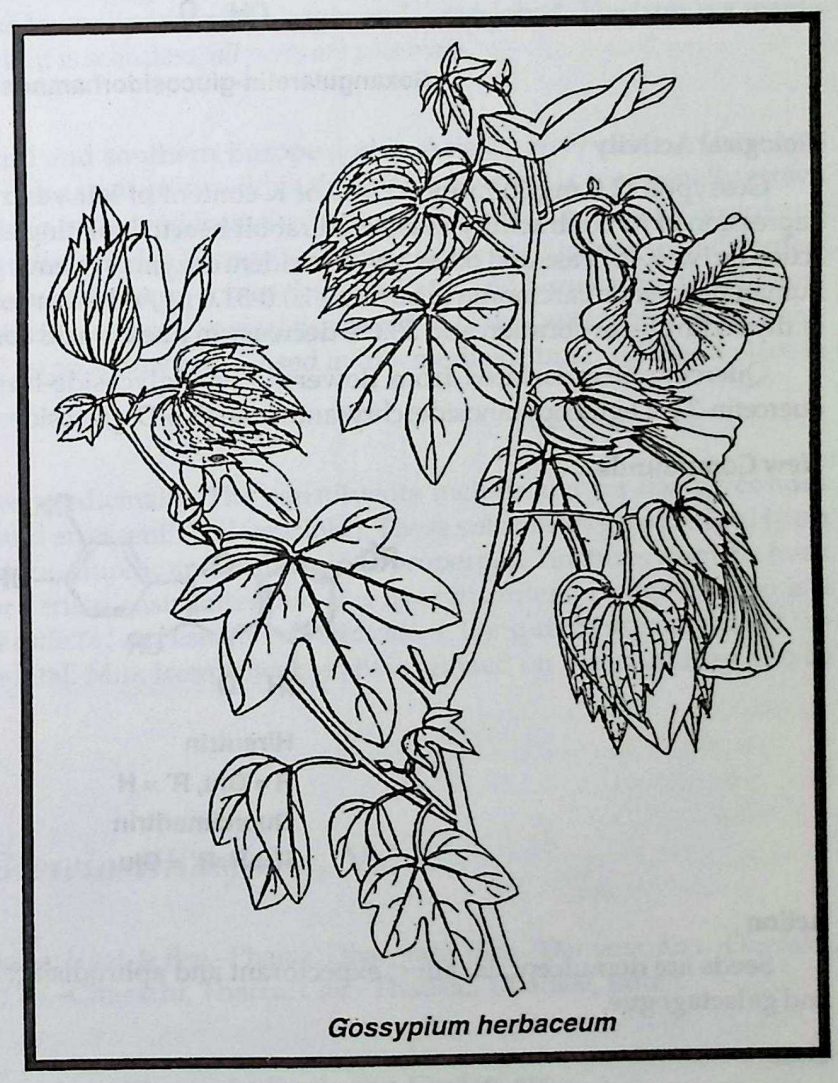
Uses

In traditional medicine, this drug is considered to be an effective remedy against rheumatism. The officinal part is the seed. It is sweet, light, and galactagogue. It gives strength to the body, dispels diseases caused by the morbidity of *tridosas* and cures thirst, burning sensation, lysuria, oedema, uterine disorders, anaemia and genitourinary diseases. Leaves are diuretic and are beneficial in mental disorders. They repress boils and cure skin diseases and rat poison. The flowers are germicidal and they purify blood and heal ulcers due to leprosy. The seeds are aphrodisiac and unctuous and are recommended in scanty lactation and diarrhoea. The drug forms an ingredient of preparations like *Karpasastyadi tailam, Karpasastyadi kulambu, Sarvamayantaka ghrtam, Svetagunjadi gulika*, etc.

Gossypium herbaceum, Linn.
(Family: Malvaceae)



Gossypium herbaceum

Vernacular Names

Sans.–Karpas; *Hind. & Bom.*–Kapas; *Ben.*–Kapas, Kapastula; *Tam.*–Parutti or Paruthi; *Tel.*–Paththi; *Fr.*–Cotonnier Herbace; *Ger.*–Baum wollpffanze.

Habitat and Varieties

Var: *Sakalia*. Typical examples of G. herbaceum are *Lalio* of Kathiawar; *Broach, Ghogari, Lalio, Kanvi* of Gujarat, and *Kumpta* or *Jowari-hatti* of the Southern Mahratta Country; and of Var: *Sakalia, Wagad* and *Sakalio* of Gujarat.

Constituents

Querdetin, betaine, choline, salicylic acid, etc. Oil determinations made on the whole seeds of *G. herbaceum* varieties found in the following places, were as follows-

(a) Surat Moisture 5.10 to 9.90; Oil 16.70 to 18.80
(b) Surti Broach Oil 21.65
(c) Goghari E. 5 Oil 16.25
(d) Dharwar Oil 18.15

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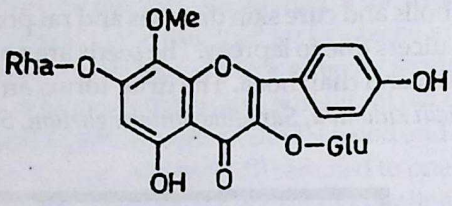
Essential oil contained caryophyllene, pinene and limonene; crystal structure of gossypol; abscisic acid, β-sitosterol and scopoletin isolated; indole-3-carboxaldehyde isolated; sexangularetin-3-glucosido-7-rhamnoside isolated from immature flower buds.

New Compounds



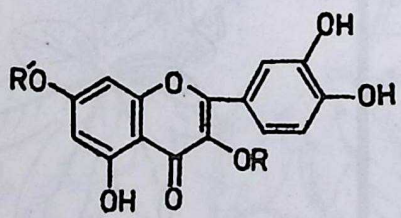
Sexangularetin-glucosidorhamnoside

Biological Activity

Gossypol, (2.0 mg/l) induced loss of K content of left ventricular myocardium together with depression of its contractility in isolated rabbit heart; depleting effect might be due to its inhibitory action on Na-K-ATPase and other Mg-dependent enzyme systems; gossypolone and megosin inhibited human pancreatic carcinoma *in vitro*. At 20.0-31.0 µg/ml these compounds caused 50.0% inhibition of thymidine incorporation and 50.0% decrease in nucleic acid content.

Quercimeritrin isolated from flowers; a new glycoside-hirsutrin, mp. 220°–characterised as quercetin-3-β-D-glucopyranoside; chrysanthemin (3-β-D-glucoside of cyanidin) from buds and flowers.

New Compounds



Hirsutrin
R = Glu, R' = H
Quercimeritrin
R = H, R' = Glu.

Action

Seeds are demulcent, laxative, expectorant and aphrodisiac. Root and bark are emmenagogue and galactagogue.

Uses

Leaves are used in scorpion-sting and snake-bite.

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Gratiola officinalis
(Family: Scrophulariaceae)

Vernacular Name

Eng.–Hedge hyssop.

Botanical Description

A perennial herb with a tangled rhizome and a clump of ascending hollow stems, square in the upper part. The leaves are opposite, sessile, lanceolate and finely serrate. The small, white to pinkish flowers grow singly from the leaf axils on long stalks. The corolla is slightly two-lipped with a wide tube; the upper lip is two-lobed, the lower lip is slightly larger and three-lobed. The fruit is a many-seeded four-valved capsule. The plant is scentless; *all parts are poisonous.*

Habitat

Hedge Hyssop grows in central and southern Europe and in Asia by river-sides, in fens, wet grassland and other damp places. It does not grow wild in the British Isles but is occasionally grown in gardens. The generic name, *Gratiola,* is derived from the Latin word *gratia* (= gratitude) on account of the plant's useful medicinal properties (Hedge Hyssop was once widely used to treat liver disorders and as a purgative). The common name 'hyssop' comes through Latin and Greek from the Hebrew word *esob* for the plant. However, the hyssop of Classical times and the Bible was probably a species of marjoram (*Origanum*). Hedge Hyssop is now rarely used in folk medicine but it still has a place in homeopathy.

Uses

The flowering stems are used medicinally. The constituents include the cardiac glycosides gratiolin, gratiogenin gratiotoxin and an essential oil (gratiold). These substances give Hedge Hysso strong purgative, emetic, cardioactive, diuretic and anthelmintic properties. Tinctures from the fresh plant are used in homeopathy for certain gastrointestinal and liver disorders. Hedge Hyssop is a dangerous plant; *it should never be collected and used for self-medication.* Long-term use may affect the eyesight; in large doses it may be fatal. Milk from cows that have grazed on the plant may also be poisonous.

Grewia tiliaefolia, Vahl.

Vernacular Names

Sans.–Dharmana, Dhanurvriksha; *Hind.* & *Ben.*–Pharsa, Dharmani; *Bom.*–Damana; *Kon.*–Dheman, Karkani; *Sant.*–Olat; *Tam.*–Thada; *Tel.*–Charachi, Tharra; *Can.*–Thadsal, Dhadsal, Butali.

Habitat

Is found in hot dry forests throughout Western India, Burma, Ceylon, etc.

Constituents

α-Amyrin, β-amyrin, β-sitosterol and erythrodiol isolated from stem bark; α-amyrin, β-amyrin, betulin, friedelin, β-sitosterol and triacontanol isolated from roots.

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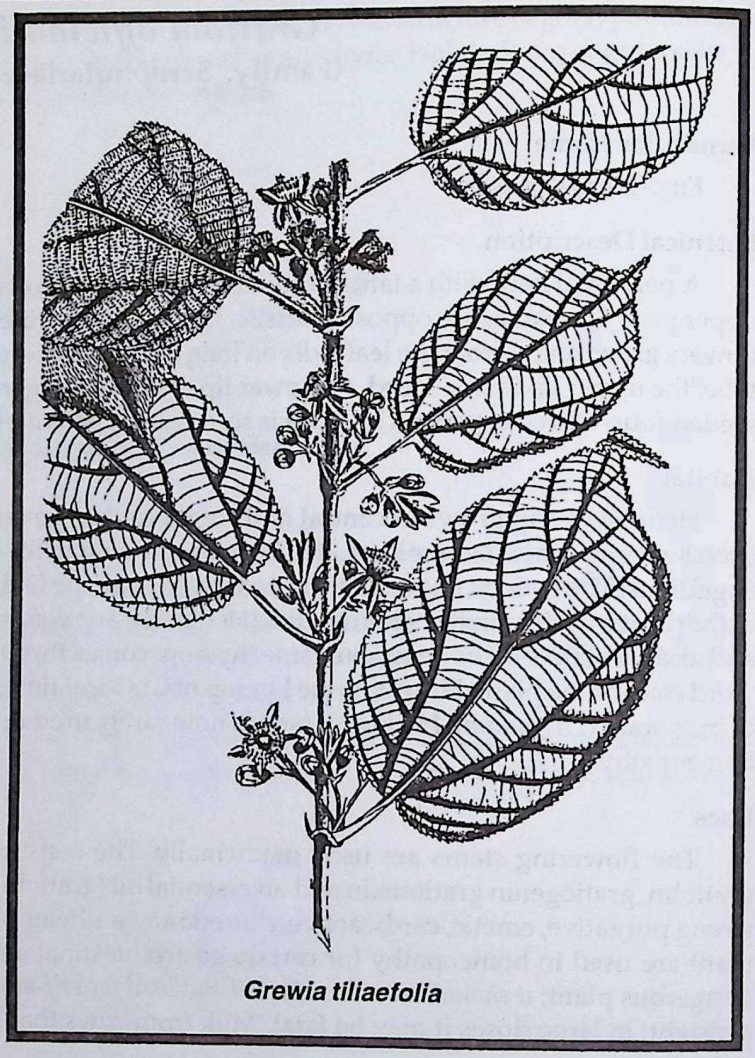
Triacontan-1-ol, α-amyrin, β-amyrin, β-sitosterol, lupenone, erythrodiol, betulin and tetratriacont-21-ol-12-one isolated from stembark and leaves.

Uvaol, ursolic acid and α-amyrin isolated from roots; 19-hydroxyuvaol, quinovic acid and β-sitosterol-3-O-glucoside also from roots.

Pelargonidin-3;5-diglucoside, quercetin, its 3-O-glucoside and naringenin-7-O-β-D-glucoside isolated from fruits; proline, lysine, glutaric acid and phenylalanine also isolated; delphinidin-3-glucoside and cyanidin-3-glucoside isolated from fruits; quercetin, kaempferol and a mixture of their glycosides isolated from leaves.

Uses

Bark which is emetic, after removal of the tuber is rubbed down with water and the thick mucilage stained from it, is given in 5 tola doses with 2 tolas of the flour of Panicum maliaceum as a remedy for dysentery and opium-poisoning. Externally the *bark* is employed to remove the irritation from cow-itch. Green leaves are much liked by cattle.



Grewia tiliaefolia

Habenaria diphylla

(Family: Orchidaceae)

Botanical Description

Tuberous herb; leaves in unequal pairs, appressed to the ground, orbicular, or broadly ovate-obtuse, base cordate, 2.5 cms diam. glabrous; flowers greenish white in many-flowered racemes; bracts ovate, acuminate; sepals ovate-acute; petals linear, subfalcate acute, as long as the sepals; lip 3-partite, laterals much longer than the mid-lobe, spur long as the ovary, inflated, acute.

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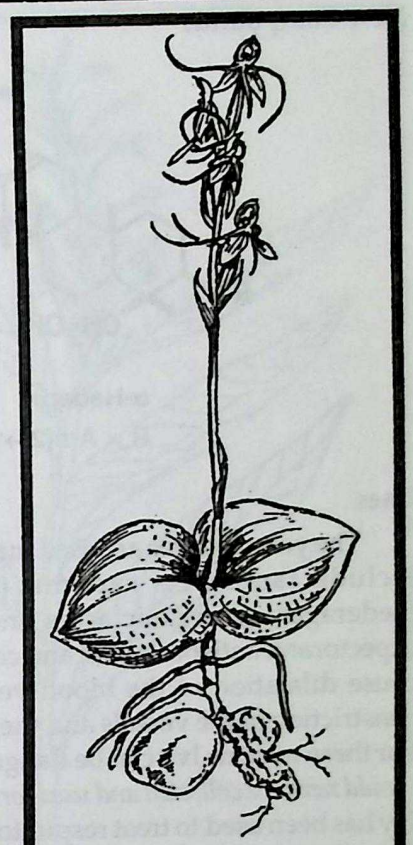
Habitat

The plant occurs in W. Coast from Kanara to Travancore at low elevations.

Uses

The drug *padmacarini* is reportedly hot, bitter and astringent. It overcomes morbid *kapha* and *vata* and cures dysuria, colic, urinary calculi, cough, asthma and poison. According to Rajanighantu, the drug is aromatic and it cures vomiting, epilepsy, *raktapitta*, diarrhoea, diabetes and diseases caused by evil spirits. *Vastyamayantaka ghrtam*, *Satavari ghrtam* etc. are some of the preparations using the drug.



Habenaria diphylla

Hedera helix, Linn.
(Family: Araliaceae)

Vernacular Names

Hind.–Lablab; *Punj.*–Banda; *Kash.*–Karmora; *Eng.*–Ivy.

Botanical Description

An evergreen woody climber, often carpeting the ground or ascending by means of many tiny, adhesive, fibrous roots on the stems. The leaves are alternate, leathery, shiny, dark green, often with pale veins and are of two kinds; entire, cordate or rhomb-shaped on the flowering branches; palmately three- to five-lobed (ivy-shaped) on the non-flowering branches. The small, greenish-yellow flowers are arranged in small terminal umbels. They secrete abundant nectar. The fruit is a globose, blue-black drupe. *All parts of the plant are poisonous* and children should be warned not to eat the berry-like fruits.

Habitat

In Europe and Asia Ivy grows wild creeping or climbing in woods, in hedges on rocks and on walls. It is common throughout the British Isles. It is also widely grown as an ornamental plant in gardens and as a covering for buildings. Ivy has long been supposed to have magical powers. It was dedicated to Bacchus, the god of wine, probably because it was supposed to prevent in toxication. The generic name, *Hedera*, is the original Latin word for the plant. The common name, Ivy, comes from the Anglo-Saxon word *ifeg*, of obscure origin.

Constituents

Rutin, kaempferol-3-glucoside, coumaric acid, ferulic acid, chlorogenic acid and scopoline from bark; hederin, mp. 256° isolated from leaves.

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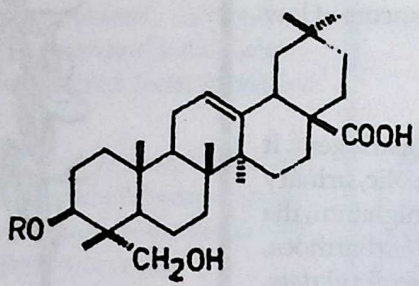
New Compounds



α-Hederin
R = Ara(2→1)Rha

Hedera helix

Uses

The young leaves are used medicinally. The constituents include tannins, a saponin (hederin), its aglycone (hederagenin), organic acids and iodine. These give Ivy expectorant, antispasmodic and cardiac actions. Small doses cause dilatation of the blood vessels, larger doses cause constriction of the vessels and the slowing of the heart beat. For these reasons Ivy can be dangerous if taken internally. *It should never be collected and used for self-medication.* In the past Ivy has been used to treat respiratory diseases and rheumatic pain. Externally the fresh leaves can be applied as a compress to slow-healing wounds, bruises and arthritic joints but they are an irritant and may cause dermatitis. If eaten the berries have a mainly purgative action, though if many are consumed the symptoms can be more severe.

Hedychium spicatum, Ham.
(Family: Scitaminaceae)

Vernacular Names

Sans.–Kapura, Kachali, Shedwa; *Hind.*–Sitruti; *Mah., Guj., & Hind.*–Kapurkachur, Kapurkachri; *Punj.*–Khor, Kachur-kachu, Ban-kela, Sheduri (Bazar-root) Kapur Kachri; *Duk.*–Velati kachur; *Tam.*–Shimai-kich-chilik-kishangu.

Historical Aspects

It is credited with diverse therapeutic properties in several ancient systems of medicine. In Ayurveda, Bhavamisra ascribed anti-inflammatory properties to the root; antiasthmatic use has been described by Charaka. In the Unani system it was considered a laxative, brain and liver tonic.

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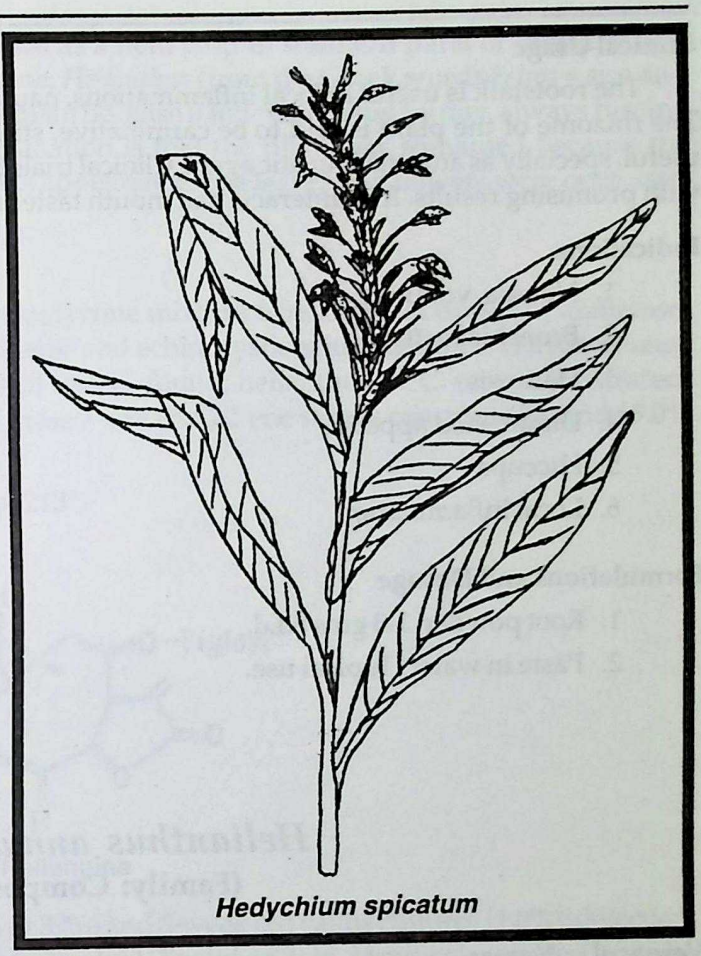
Botanical Description

It is an annual herb, with a horizontal *root-stock* and tuberous *root-fibres*, *leaves* are 30 cms or more in length. *Inflorescence* is spiked. *Flowers* ascending and dense yellow coloured. *Capsule* is globose.



Hedychium spicatum

Habitat

It grows in subtropical Himalayas, and also abundantly in Punjab and Nepal.

Parts Used

Rhizome.

Pharmacognosy

Macroscopic and microscopic characteristics have been studied. The root has a camphoraceous smell.

Phytochemistry

The dried rhizome of the plant contains essential oil, starch, resins, organic acids and a glycoside; albumen and saccharine are also present. The essential oil has ethyl ester of p-methoxy cinnamic acid, d-sabirene cineole, sesquiterpenes and pentadecane methyl paracumarine acetate. It contain β-sitosterol and its β-D-glycoside.

Ayurvedic Properties

Guna: Laghu, Tikshna; *Rasa*: Katu, Tikta, Kashaya; *Veerya*: Ushna; *Vipaka*: Katu; *Dosha*: Kaphaghna, Vataghna; *Karma*: Mukhavairasyanashini, Durgandhyahara, Kasaghna, Hikkahara, Chhardihara, Shothahara.

Pharmacology

In preliminary pharmacological studies the drug is found to have a vasodilatory effect on coronary vessels, mild hypotensive property and a non-specific antispasmodic effect on smooth muscles. Studies on the essential oil of the rhizomes of *Hedychium spicatum* reveal that these oils possess a mild tranquilizing effect of short duration. They depressed the conditioned avoidance response, rotarod performance and potentiated pentobarbitone hypnosis and morphine analgesia in rats. The crude ethanolic extract of rhizomes possesses anti-inflammatory and analgesic activity. The anti-inflammatory activity was mainly localised in the hexane fraction from which 1% of pure active constituent was isolated. The analgesic activity was more prominent in the benzene fraction. Some other minor active constituents were also present which may contribute to the total activity of rhizomes.

Safety

In the doses commonly used, no adverse reactions have been reported.

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Clinical Usage

The rootstalk is useful in local inflammations, nausea, asthma, bronchitis, hiccups, and in pain. The rhizome of the plant is said to be carminative, stimulant and a tonic. It has been described as useful, specially as an antiasthmatic agent. Clinical trials have been conducted in tropical eosinophilia, with promising results. It counteracts bad mouth taste and smell.

Indications

1. Nausea, vomiting
2. Bronchial asthma
3. Halitosis
4. Diminished appetite
5. Hiccups
6. Local inflammation

Formulations and Dosage

1. Root powder: 1-3 gms b.i.d.
2. Paste in water: Topical use.

Helianthus annus, Linn.
(Family: Compositae)

Vernacular Names

Sans.–Arkakantha, Adityabhakta, Suria-mukhi; *Hind.*–Hurduja, Suraj-mukhi; *Ben.*–Surajmukhi; *Eng.*–Sunflower; *Guj.*–Surajmukh; *Mah.*–Surya-phul; *Bom.*–Surajmaki; Tel. & *Tam.*–Aditya-bhakti-chettu, Suryakanti; *Can.*–Suryakanti; *Kon.*–Suryakamal; *Pers.*–Gul-e-aftab.

Botanical Description

A tall annual herb with an erect, sometimes branched hairy stem. The many leaves are large and cordate, opposite below and alternate and long-stalked above. The large, terminal showy flowerheads are composed of yellow ray-florets, which are sterile, and purplish-brown, tubular disc-florets. The fruit is a slightly flattened achene, often streaked with white and black.

This plant is common in Indian gardens, in swampy and malarious districts as its presence purifies the air. Seeds yielded 4.00 p.c. moisture and 46.00 p.c. oil on kernels, and the oil (Sunflower Oil) is used for culinary and table purposes like olive or almond oil, and is also used in scorpion-sting. Its oil-cake is a valuable food for cattle and poultry.

Habitat

Sunflower is a native of western North America where it was first cultivated by American Indian some time before 1000 BC. It was produced to Europe in the 16th century but did not become a major food plant until it reached Russia, where large-scale cultivation began. Today it is grown commercially in many parts of the world for oil, fodder and ornament. There are many cultivated varieties, some

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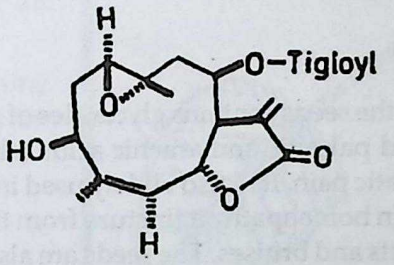
with flowerheads up to 40 cm wide. It is grown as a field crop in southern parts of England. The common name, Sunflower, and the generic name, *Helianthus* (from the Greek words *helios* = sun and *anthos* = flower), were supposedly given to the plant because it follows the sun by day, always turning towards its direct rays. Just as likely an explanation is that the plant was so-named because the flowerheads with disc and ray suggest the sun's appearance. The leaves and flowers were once used to treat malaria.

Constituents

Echinocystic acid, mp. 294°, identified in aglycone mixture from saponin of petals; arabinose; glucose; rhamnose, xylose, and oleanolic, albigenic and echinocystic acids identified in hydrolysates of saponins; three saponins–helianthosides A,B and C–found; helianthoside C. mp. 215°, isolated; total sterols in flowers estimated as 0.08%; of these 7-ene and 22-ene sterols constitute 7.0 and 63.0% respectively.

Isolation and structure of heliangine, mp. 213°.

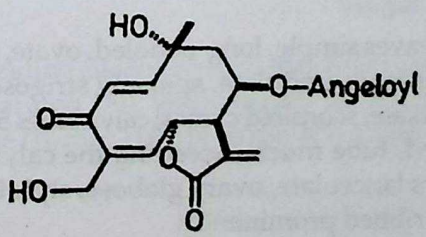
New Compounds



Heliangine

Histamine content in 5-day old seedlings (0.39%) and 8-week old callus cultures (1.0%); detection of α-terpinene, terpinyl acetate, bornyl acetate, linalool, linalyl acetate, terpineol, menthyl acetate, artemisia ketone, camphor, p-cymene, 1,8-cineole, citral, limonene, isomenthol, menthol, α-pinene and β-pinene in essential oil from sunflower tubular corollas; heliantriols B0, B1, B2 and A1 along with manilladiol and longispinogenin isolated and their structures elucidated; new sesquiterpene lactone–annuithrin–isolated from young leaves and its structure mined; ent-15-beyeren-19-oic acid and a mixture of acetate,–angelate and–isovalerate esters of ent-15β-hydroxy-16-kauren-19-oic-ent-15β-hydroxytrachyloban-19-oic acids isolated from flower heads; essential oil (0.4-0.61%) obtained from menthol content (27.0%) in oil; new germacranolide (I) along with niveusin B and its ethoxy derivative isolated; structure I determined; trachyloban-19-oic and (-)kaur-16-ent acids isolated from stems; α- and β-pinenes, sabinine and identified as major compounds in volatile oil from flowers; 24α-methyl-5α-cholest-7-en-3β-ol isolated from.

New Compounds



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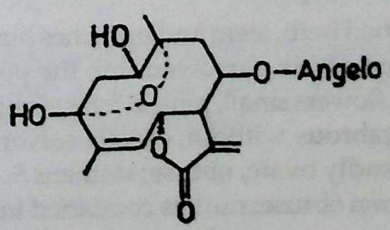

Annuithrin

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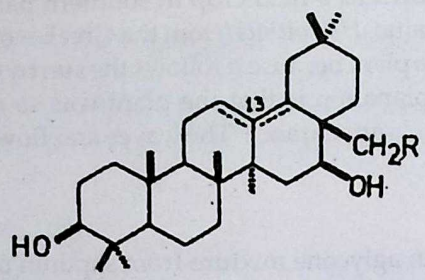
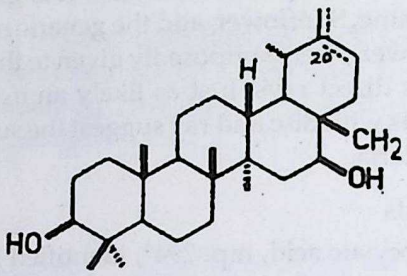


Heliantriol A1
Δ13(18), R = OH
Manilladiol
Δ12(13), R = H
Longispinogenin
Δ12(13), R = OH



Heliantriol B0
Δ20(21)
Heliantriol B1
Δ20(29)

Uses

The expressed fatty oil from the seeds contains glycerides of unsaturated linolenic and oleic acids (about 45 per cent) and saturated palmitic and arachic acids (about 4 per cent). It is used in salves, plasters and liniments for rheumatic pain. It is also widely used in foodstuffs as a salad and margerine oils, in soaps and as a lubricant. In homeopathy a tincture from the seeds is used internally to relieve constipation and externally on cuts and bruises. The seeds are also roasted and eaten, used as a coffee substitute and ground into flour.

The dried flowerheads are also used medicinally in some countries. They have diuretic, carminative, anti-inflammatory and antidiarrhoeal properties.

Heliotropium indicum, Linn.

(Family: Boraginaceae)

Vernacular Names

Sans.–Srihastini, Suryavarta, Hastisunda; *Eng.*–Helio-trope; *Hind.*–Hatta-juri; *Mah.*–Burundi; *Guj.*–Hathisundhana; *Hind. & Ben.*–Hatisura; *Tel.*–Nagadanti; *Tam.*–Nakkipoo; *Tel.*–Kodukki; *Mal.*–Telkata, Teliyenni; *Can.*–Chalukondee; *Kon.*–Ajeru; *Fr.*–Heliotrope-des-Indes.

Botanical Description

Branched herb, stem and branches hirsute; leaves simple, long-petioled, ovate, acute or obtuse, to 14.5 × 6.8 cms base narrowed into the petiole, margin undulate, sparsely strigose along nerves on either side; flowers small, pink in long terminal-spikate, scorpioid cymes; calyx lobes 5, linear-lanceolate, sparsely scabrous without; corolla salver-shaped, tube much exceeding the calyx, minutely hairy, lobes 5, broadly ovate, obtuse; stamens 5, anthers lanceolate; ovary globose, style 0.7 mm, disciform above, stigma obtuse; nutlets combined in pairs, ribbed prominently.

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Habitat

A small fragrant plant, indigenous to Cochin-China, but found in ditches in many parts of India.

A common weed in sandy fields and waste places in all plains districts in India. It is also reported from Africa, tropical Himalaya, India, Burma, east to W & S. China, Malaysia and America.

Parts Used

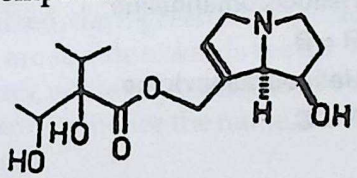
Herb.

Constituents

Stems and leaves contain tannin, a non-crystalline organic acid and an alkaloid soluble in ether.

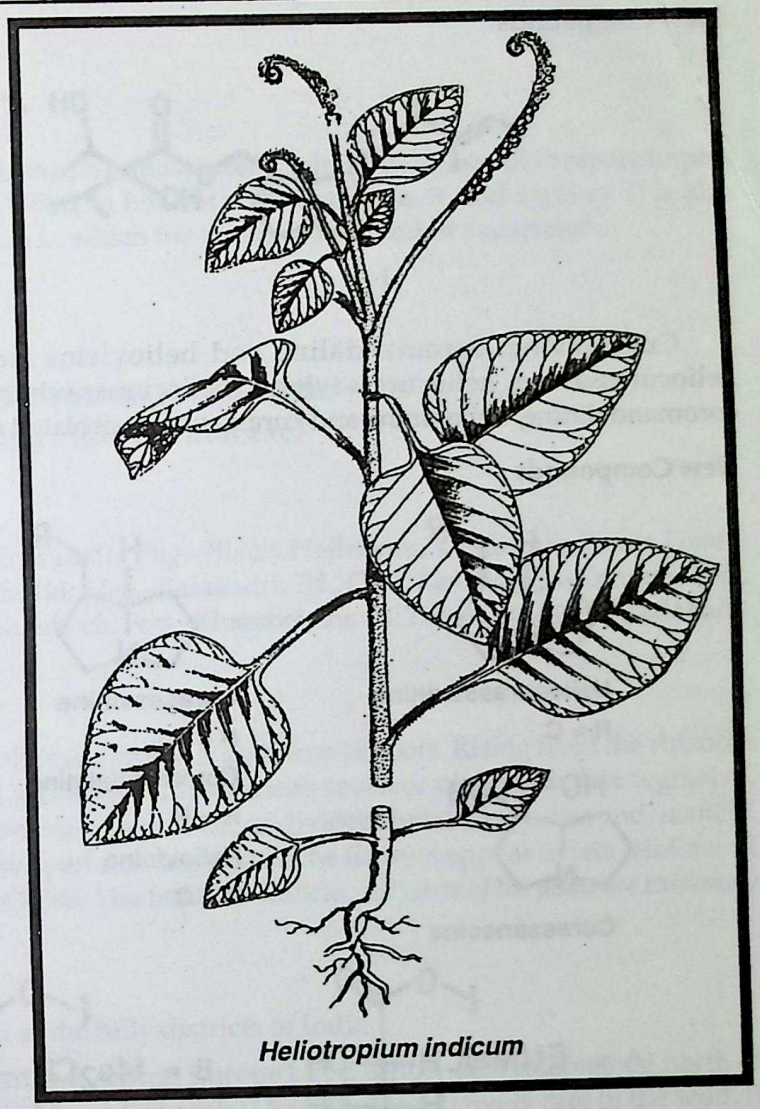
Indicine, acetylindicine, indicinine and an ester of retronecine with an unidentified acid isolated.

New Compounds



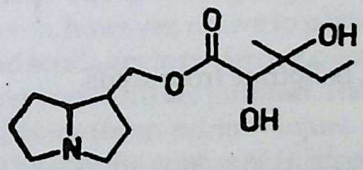
Indicine

A new pyrrolizidine alkaloid–strigosine–isolated.



Heliotropium indicum

New Compounds



Strigosine

Three pyrrolizidine alkaloids–supinine, heliosupine and echinatine–isolated; two minor alkaloids could not be separated but were shown by hydrogenolysis to be viridifloric acid esters of 7-angelylheliotridine (I), mp. 116°; N-oxide of 7-angelylheliotridine also isolated.

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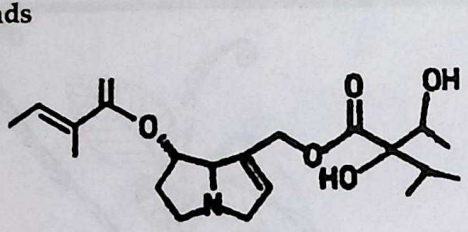
New Compounds



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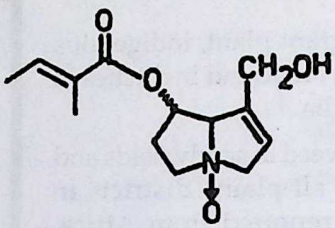
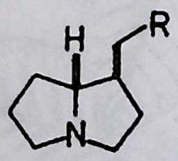


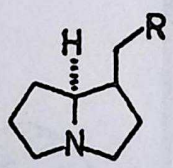
7-angelylheliotridine N-oxide

Curassavine, coromandaline and heliovicine isolated; new pyrrolizidine alkaloids–heliocurassavine, heliocurassavicine, heliocurassavinine, curassavinine, heliocoromandaline, coromandalinine, heliovinine and curassanecine–isolated and their structures elucidated.

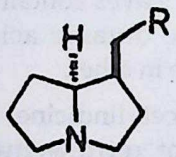
New Compounds



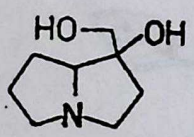
Heliocurassavinine
R = C



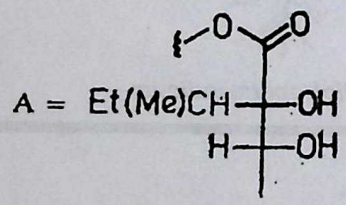
Curassavinine
R = A
Coromandalinine
R = B
Heliovinine
R = C

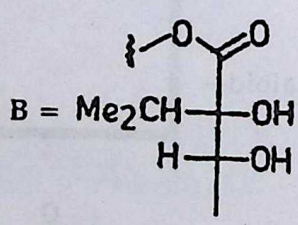


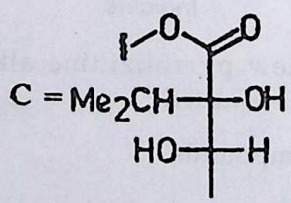
Heliocurassavine
R = A
Heliocoromandaline
R = B
Heliocurassavicine
R = C



Curassanecine







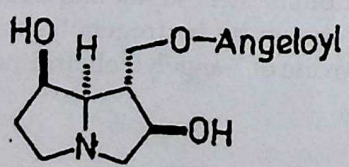
Rapanone and lupeol isolated; heliotrine from seeds.

Biological Activity

Heliotrine showed *in vivo* and *in vitro* ganglion–blocking activity.

Helifoline isolated along with retronecine and its structure determined.

New Compounds



Helifoline

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Action

Local anodyne.

Uses

Juice of the leaves is used as an application to wounds, sores, boils, gum-boils and to repel pimples on the face; boiled with castor oil it is applied to bites of scorpions, insects and reptiles. It is also employed locally in the kind of ophthalmia in which the tarsus is inflamed or excoriated.

Helleborus niger, Linn.
(Family: Ranunculaceae)

Vernacular Names

Sans.–Vakragra, Katurohini, Krishnabhedi; *Eng.*–Black Hellebore, Christmas Rose; *Hind.*–Kalikatuki, Khorasani-kutki; *Ben.*–Kala-kutki; *Mah.*–Balakadu; *Tel., Can., Kon. & Mal.*–Katukarohini; *Bom.*–Kutki; *Guj.*–Koddu; *Arab.*–Khartu, Kuerbeck; *Pers.*–Kharabekahindi; *Tam.*–Katurohini, Kadagaruganie; *Sinh.*–Calurana; *Kash.*–Kaur.

Botanical Description

A perennial herb with a thick black rhizome and a large clump of roots. Rising from the rhizome are stalked, dark-green, evergreen basal leaves each divided into seven or nine lanceolate segments, which are serrate towards the tip. The flowering stems bear undivided, bract-like leaves and, usually, a solitary, white or pinkish flower with five perianth segments. The flowers appear in late winter and early spring, hence the name, Christmas Rose. The fruit is a follicle. *All parts of the plant are extremely poisonous.*

Habitat

Found plentifully on the Ghats and in the hilly districts of India.

Christmas Rose is native to southern and central Europe but it is now also established north of the Alps. It grows on lime-rich soils in woods and on rocky slopes but is relatively rare in the wild. It does not grow wild in the British Isles but is often grown as a garden plant. The related Green Hellebore (*H. viridis*)–also poisonous–is, however, native to parts of England and Wales where it has a local distribution in moist woods and scrub, again preferring calcareous soils. Its flowers are yellowish green. Those of Purple Hellebore (*H. purpurascens*) are purplish. The generic name, *Helleborus*, is believed to derive from the Greek word *helleboros* (from *helein* = injure and *bora* = food) and indicates the poisonous qualities of these plants. The specific epithet of *H. niger* and the alternative common name, Black Hellebore, refer to the dark-coloured rhizome. The medicinal properties of hellebores have been known since ancient Greek times.

Parts Used

Dried rootlets and rhizome.

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Constituents

Helleborin and Helleborein–both crystalling, and poisonous resin, fat, etc. Helleborin is insoluble in water, but soluble in alcohol and chloroform. Helleborein is very soluble in water, slightly so in alcohol and insoluble in ether.

Action

Hydrogogue, cathartic, emmenagogue and anthelmintic; in large doses acro-narcotic poison. In small doses it acts like digitalis, as a cardiac tonic, slows the frequency of the heart. In toxic doses it causes gradual paralysis of the heart, convulsions and death. As a local anaesthetic for ophthalmic treatment, it is more powerful than cocaine; 3 to 4 drops of 1 p.c. solution of helleborein causes complete anaesthesia last for half an hour, of the conjunctiva and cornea for operative purposes.

Uses

Root of this plant was formerly employed in apoplexy; amenorrhoea, epilepsy, dropsy, hypochondriosis, mania, melancholia and chronic skin affections, and worms. it is now *prescribed under great care, as it is in large doses an acronarcotic poison.* Dose of *powdered root* is from 5 to 10 grains; with aromatics it is given in dyspepsia etc., in doses of 10 to 20 grains; dose of the *tincture* is one drachm, and of the *fluid extract*–5 to 20 minims; of the *solid extract*–1 to 4 grains cautiously; of the powdered root as a purgative, the dose is 1 drachm. *Kalikatuki* is used chiefly as a bitter and antiperiodic for children, as its name *Balkadu* indicates. It is not believed to have any drastic purgative properties by Hindu Vaidyas; if at all, very mild properties of this nature.

The rhizomes and roots contain the toxic cardiac glycosides hellebrin, helleborin and helleborein that affect the heart and the central nervous system. They are also strongly purgative and diuretic. Because of the variable concentration and toxicity of these substances. Christmas Rose is now contained only in a few proprietary medicines (used on the Continent) and in tinctures used in homeopathy for certain neurological disorders. *Any use of Christmas Rose should be medically supervised. It should never be collected and used for self-medication.*

Hemionitis arifolia

(Family: Cheilanthaceae)

Botanical Description

A small, terrestrial, rhizomatous fern; rhizomes short, 5-10 cms long, suberect, covered with persistent leaf bases; scales lanceolate-acuminate; leaves dimorphic, sterile ones deeply cordate, fertile ones sagitate, stiped, shining green, coriaceous, reticulately veined; sori covering the entire lower surface.

Habitat

N.E. and southern India, Burma, Malaysia and Philippines.

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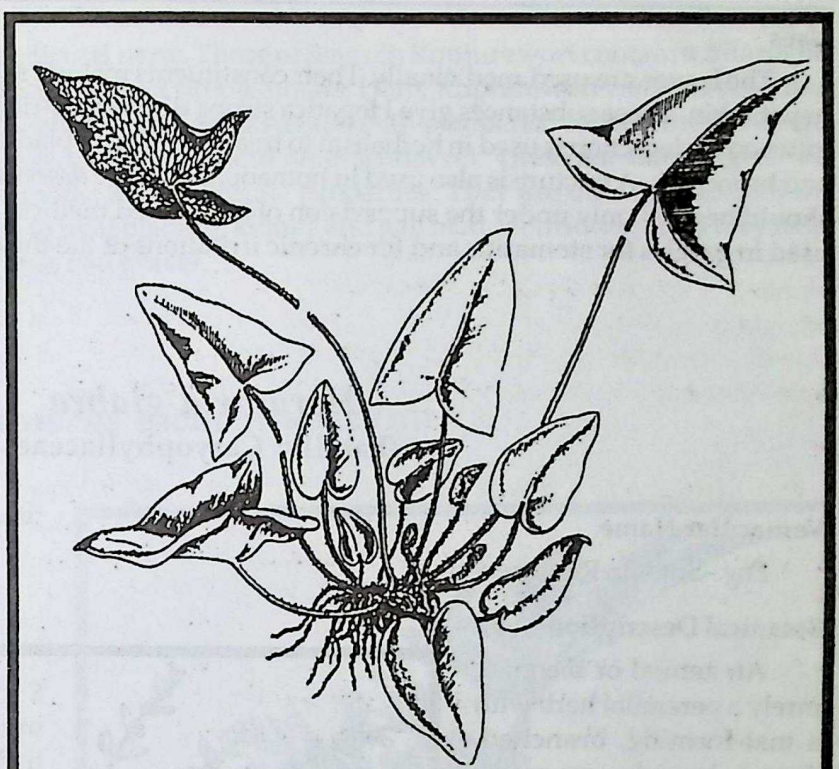
Uses

As the name indicates, the plant has leaves which resemble the ears of a rat or mouse (*akhukarni, akhuparni, musakarni,* etc.). Caraka includes this among anthelmintics. According to *Bhavaprakasa nighantu,* it is acrid, bitter, astringent, cooling and light and overcomes urinary afflictions, diseases due to the morbidity of *kapha,* worms, fever and gastric problems. A decoction of the plant is said to act as deobstruent, diuretic and alterative, useful in rheumatism, neuralgia and headache. Leaf juice is given for migraine, headache and bites of rats and snakes. It is used as an eardrop in cases of ulcers, abscesses, etc. The whole plant is used medicinally. The drug is an ingredient of *Surasadi tailam.*



Hemionitis arifolia

Hepatica nobilis

(Family: Ranunculaceae)

Vernacular Name

Eng.–Hepatica.

Botanical Description

A perennial herb with a short scaly rhizome, which bears light-blue, rarely pink or white flowers and, after they have faded, smooth, almost leathery, trifoliate and liver-shaped leaves, green above and reddish-purple below. There is an involucre of three green bracts just below the flowers. The flowers produce a fair quantity of pollen but little nectar. The fruit is an achene.

Habitat

Hepatica is common in dampish woods, scrub and grassland throughout most of Europe. It does not grow wild in the British Isles but is grown in many varieties as a rock-garden plant. In some countries it is now a protected species. The generic and common names are derived from the Greek word *hepatikos,* meaning pertaining to the liver (*hepar* = liver), an allusion to the shape of the leaves.

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Uses

The leaves are used medicinally. Their constituents include saponins, tannins and the glycoside hepatilobin. These substances give Hepatica strong diuretic, astringent and vulnerary properties. An infusion or decoction is used in herbalism to treat kidney, gall bladder and liver disorders, and coughs and bronchitis. A tincture is also used in homeopathy. *Large doses can be toxic*; for this reason Hepatica should be used only under the supervision of a qualified medical or herbal practitioner. The herb is used in gargles for stomatitis and for chronic irritations of the throat and pharynx.

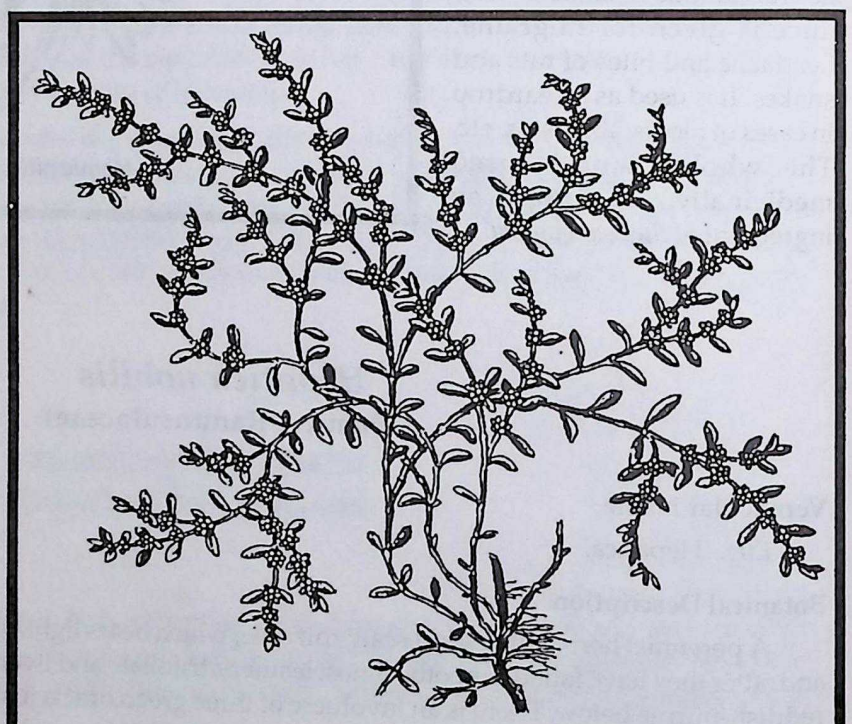
Herniaria glabra
(Family: Caryophyllaceae)

Vernacular Name

Eng.–Smooth Rupturewort.

Botanical Description

An annual or biennial, rarely a perennial herb with a mat-forming, branched, densely leaved, more or less glabrous prostrate stem. From the axils of the small, oval, sessile, yellow-green leaves grow racemes of small, white flowers. The fruit is a nutlet with one shiny black seed.



Herniaria glabra

Habitat

Smooth Rupturewort grows throughout most of Europe in dry sandy places. In the British Isles it is an extremely rare native plant occurring in a few scattered places, mostly in East Anglia. Another rupturewort, Hairy Rupturewort (*H. hirsuta*), was introduced to Britain and is now naturalized in a few localities. As its name suggests this species is hairy all over and the whole plant appears grey or whitish. The flowers are arranged in distinct roundish axillary clusters. Ruptureworts were once used to treat urinary disorders and hernias, hence the generic name *Herniaria* (from the Latin word *hernia*) and the common name Rupturewort. Both species are still used in herbalism.

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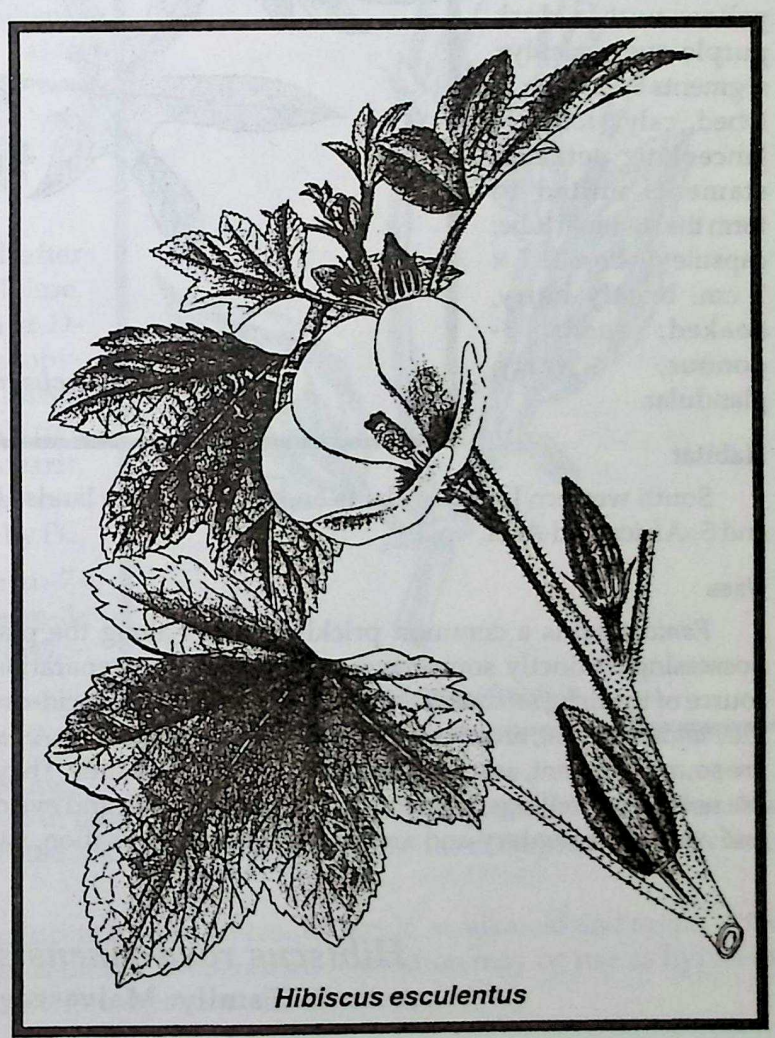
Uses

The flowering stems are the medicinal parts. Those of Smooth Rupturewort contain a triterpene saponin that decomposes into quillaiac acid and simple sugars. Hairy Rupturewort contains saponins that decompose into galactonic acid, glucose and other sugars. Both plants also contain the flavonoid glycoside rutin, the coumarin glycoside herniarin and an essential oil. These substances give the plants mild diuretic, mild antispasmodic and antiseptic properties. They are used in infusions on their own or mixed with other herbs to treat bladder, kidney and gall bladder disorders and they help prevent the formation of kidney stones and gravel.

Hibiscus esculentus, Linn.

Vernacular Names

Eng.–Ladies Finger, *M.*–Bhenda; *Hind.*–Bhindi.



Hibiscus esculentus

Illness : **Gonorrhoea**

Part used : Root

Preparation : Dried roots of 2 plants are pounded to make a coarse powder. A hole is made into a coconut and the powder is put into it together with ½ teaspoon of sugar. After 15 minutes the coconut is broken, and the water drunk.

Dosage : Half a coconut is eaten in the morning and half in the evening for 7 days.

Illness : **Weakness**

Part used : Roots

Preparation : Half a cup of dried roots are powdered.

Dosage : 2 teaspoons full of powder are taken with water, morning and evening, until cured.

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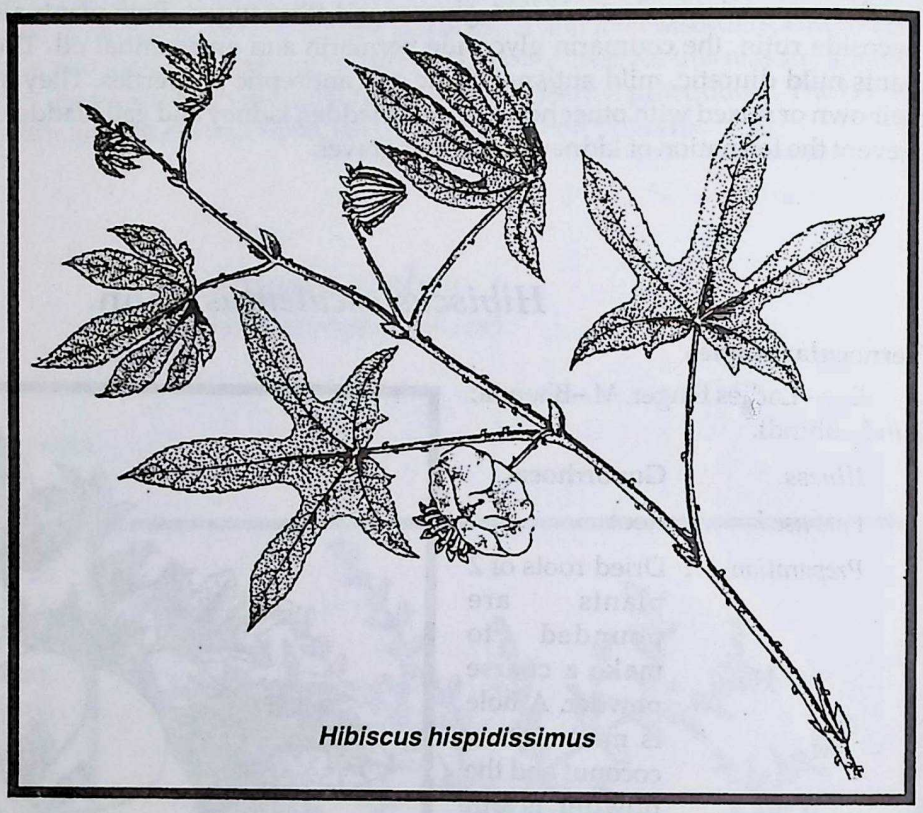
Hibiscus hispidissimus
(Family: Malvaceae)

Botanical Description

Rambling shrub with recurved prickles; leaves digitately 3-5 lobed, apically lanceolate, crenate-serrate, 3-5 × 1-3.5 cm, prickly on the midveins beneath; flower solitary, bright yellow with a dark purple eye; epicalyx segments 8-12, each 2-lobed, calyx lobes 5, lanceolate; petals 5; staments united to form the staminal tube; capsule globose, 1.5 × 1 cm, bristly hairy, beaked; seeds 3-gonous, warty, glandular.



Hibiscus hispidissimus

Habitat

South western India in plains and hills in waste lands. Also reported from Sri Lanka, tropical and S. Africa and Asia.

Uses

Paniccakam is a common prickly climber along the plains and hills of south western India, possessing distinctly sour leaves, often used for preparation of chutneys. The leaves are also the source of the drug *sathambasthi*. This drug, one the five acid-drugs (*pancamla*), is a major constituent of the *Pancamlatailam*, an oil preparation for body-anointing, *Annabhedi sinduram* and *Abhram*. The leaves are sour, astringent, anti-inflammatory and anthelmintic. They are reported to improve digestion and are useful in swellings, intestinal worms, dyspepsia and eye diseases, The roots are cooling, diuretic and anti-inflammatory and are used in burning sensation, swellings and kidney disorders.

Hibiscus rosa-sinensis, Linn.
(Family: Malvaceae)

Vernacular Names

Sans.–Japa, Rudhrapushpa; *Eng.*–China or Chinese Rose or Shoe-flower plant, Common Garden Hibiscus; *Fr.*–Rose de Chine, Ketmie de Cochin Chine; *Ger.*–Rosen artige Ketmie; *Hind.*–Jasund, Jassoon,

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Gudhal; *Ben.*–Jaba; *Guj.*–Jasunt; *Mah.*–Jasavanda; *Tel.*–Javapushpamu, Mandara, Dasani, Daanachettu; *Tam.*–Shamberattai, Sappattup-pu, Sappaththi, Semparathan; *Mal.*–Champarutti; *Can.*–Dasanige; *Pers.*–Angharee-hind; *Kon.*–Dasun.

Habitat

Very common in flower-gardens of India.

Parts Used

Roots, flowers and seeds.

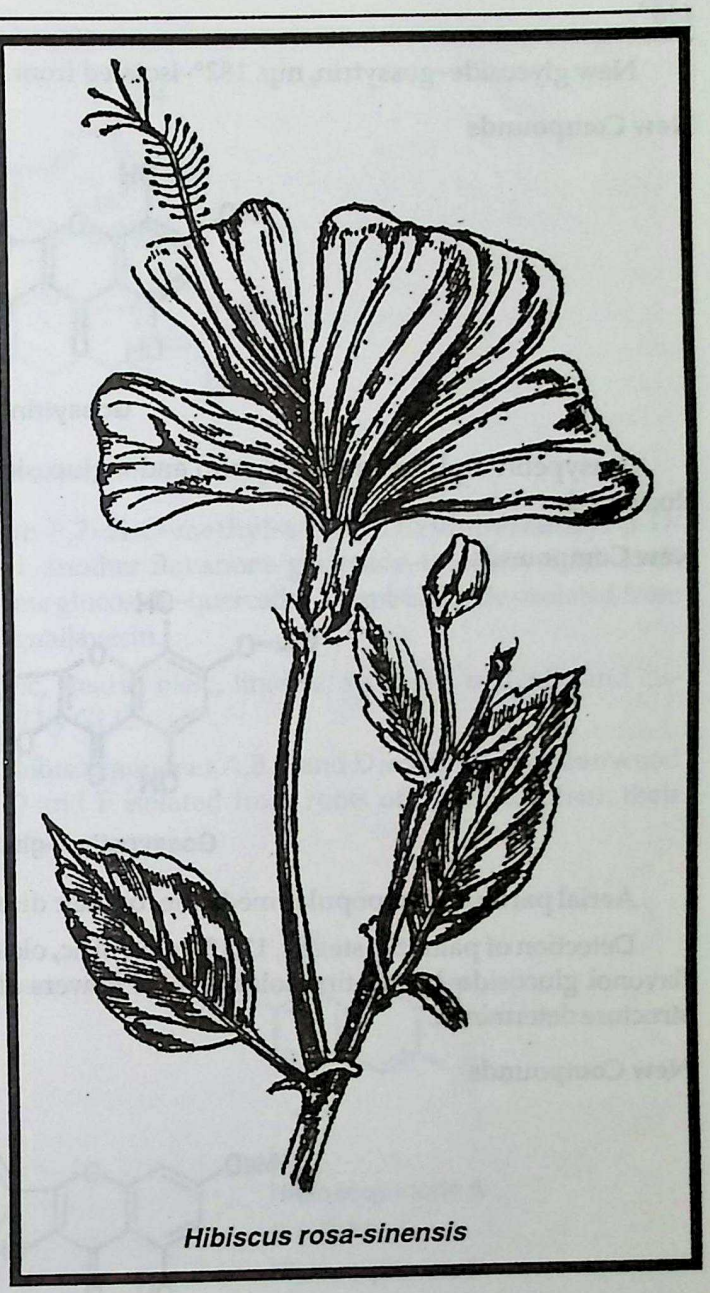
Action

Flowers are retrigerant, emollient, demulcent and aphrodisiac; also emmenagogue. Dark-red petals are demulcent. Leaves are emollient, anodyne and aperient or laxative.

Constituents

Aldobiouronic acid, isolated after partial acid hydrolysis of hemicellulose, identified as 2-O-(4-O-methyl-α-D-glucopyranosyluronic acid)-D-xylopyranose; rutin and isoquercitrin from leaves; total ash (8.1) and fatty oil (19.0%) from undecorticated seeds; palmitic, stearic, oleic and linoleic acids and β-sitosterol detected in unsaponifiable fraction by PC.

Ouercimeritrin (quercetin-7-glucoside), meratrin (quercetin-3-diglucoside) and cyanin (cyanidin-3,5-diglucoside) identified in flowers.



Hibiscus rosa-sinensis

Biological Activity

The glycosidic material at 40-80 mg/kg. i.v. exhibited hypotensive action in intact and spinal; dogs which persisted for 1-2 hrs. It also showed antispasmodic action on isolated smooth muscles, apparently due to the presence of cholingeric and papaverine-like substances.

Extract of flowers contained reducing sugars, glycosides, acids, an alkaloid and resins, acted as antispasmodic in intestine and uterus muscle preparations. Decoction may be use as hypotensive agent since it lowered blood pressure without producing side-effects.

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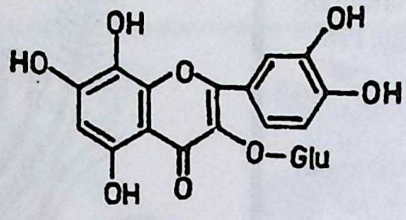
New glycoside–gossytrin, mp. 182°–isolated from flower petals and structure determine.

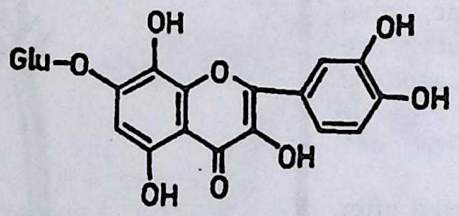
New Compounds



Gossytrin

Gossypetin-3-glucoside (gossytrin) and 7-glucoside isolated from flowers and their structures elucidated.

New Compounds

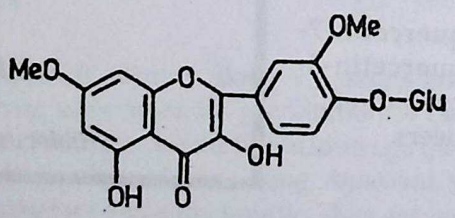


Gossypetin-7-glucoside

Aerial parts used in popular medicine for their diuretic action.

Detection of palmitic, stearic, 12,13-epoxyoleic, oleic and linoleic acids in seed oil by GLC; a new flavonol glucoside–hibiscatin–isolated from flowers along with gossypin and gossypitrin and its structure determined.

New Compounds



Hibiscatin

(-)Epicatechol, (-)epicatechol gallate, (+)catechol and (-)epigallocatechol gallate isolated from roots; detection of tridecanoic (10.9), palmitic (38.94), stearic (tr), oleic and linoleic (37.7) and sterculic (2.68%) acids in seed oil by GLC; two dimeric proanthocyanidins B5 and B6 isolated from root bark; tentative structure of B5 as 3,5, 7,3′,4′-pentahydroxyflavan dimer proposed whereas structure of B6 has been elucidated.

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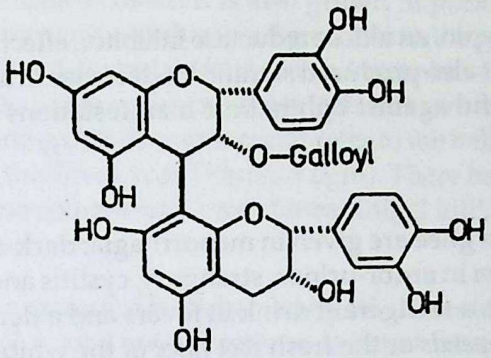
New Compounds



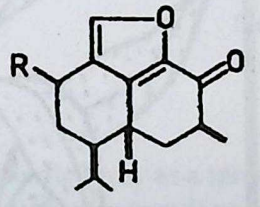
Proanthocyanidin B6

A new flavanone glycoside–naringenin-5,7-di-O-methyl-4′-O-β-D-xylopyranosyl-β-D-arabinopyranoside–isolated and characterised; another flavanone glycoside–eriodictyol-5,7-di-O-methyl-4′-O-β-D-arabinopyranoside-isolated; new glucoside–quercetin-3-sambubioside–isolated from flowers along with isoquercitrin, hyperin and guaijaverin.

Detection of myristic, palmitic, palmitoleic, stearic, oleic, linoleic, sterculic, malvalic and cis-12,13-epoxy-cis-9-octadecenoic acids in seed oil by GLC.

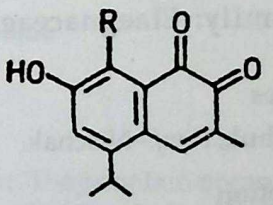
Hibiscones A,B,C (gmelofuran) and D and hibiscoquinones A,B,C and D isolated from heartwood of Sri Lankan plant; gossypol, mansonones D and F isolated from roots of Brazilian plant; their structures determined.

New Compounds

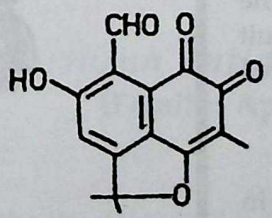


Hibiscone A

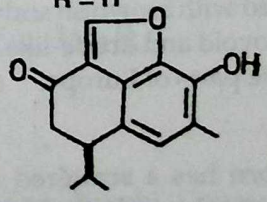
R = H
Hibiscone B
R = β-OH



Hibiscoquinone A
R = CHO
Hibiscoquinone B
R = OH
Hibiscoquinone C
R = H



Hibiscoquinone D



Hibiscone D

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Biological Activity

Oral administration of gossypin, an aldose reductase inhibitor, effectively delayed onset of cataract formation in galactosemic rats. It also produced significant decrease in accumulation of lens galactitol in these animals. It may be useful against ophthalmic manifestations initiated by accumulation of polyols in lens.

Uses

Flowers of this plant fried in ghee are given in menorrhagia; dark-red *petals* are administered in the form of a *mucilaginous infusion* in ardor-urinae, strangury, cystitis and other irritable conditions of the genito-urinary tract; it is also a refrigerant drink in fevers and a demulcent in cough. Combined with milk, sugar and cumin the *petals* or the fresh *root juice* of the white flowered variety is given in gonorrhoea. In menorrhagia *powder of the root* combined with equal quantity of the powdered lotus root and the bark of Eriodendron anfractuosum is given in doses of 1 to 1½ drachms, with benefit. Root is valuable in cough. *Seeds pounded* into a pulp and mixed with water are given with much benefit in gonorrhoea. *Expressed juice of the leaves* is also given. An *oil* made by mixing the juice of the fresh petals and olive oil in equal proportions and boiling till the water has evaporated is useful as a stimulating application for increasing the growth and colour of the hair. In China a black dye is prepared from the *petals*, for the hair and the eye-brows. *Buds* are employed in the cure of seminal weakness. The drug is used as a substitute for Althaea.

Hippophae rhamnoides, Linn.
(Family: Elaegnaceae)

Vernacular Names

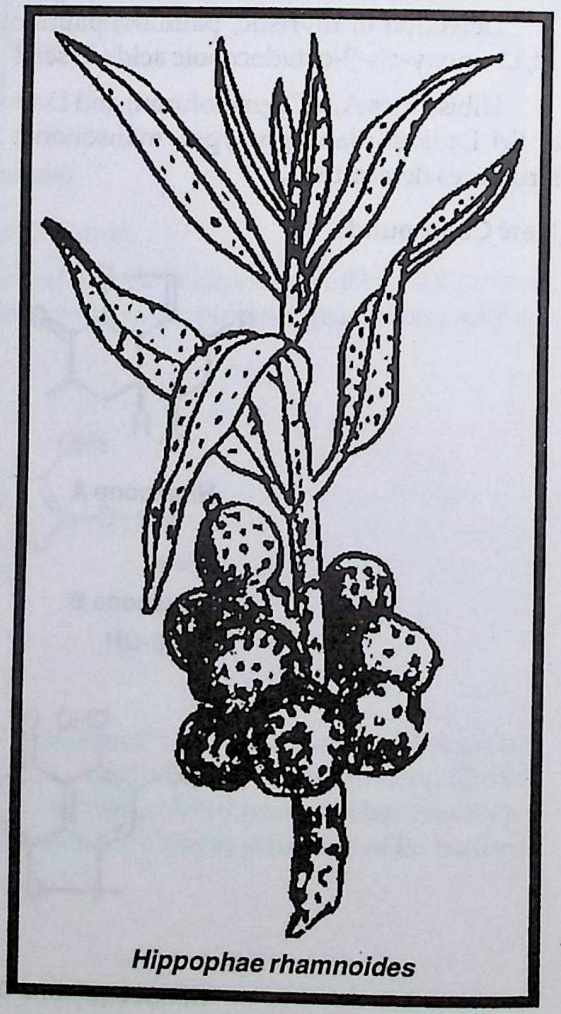
Hind.–Dhurchuk; *Punj.*–Neichak.

Botanical Description

A deciduous shrub or small tree with much-branched, thorny grey twigs and alternate, almost sessile, linear to lanceolate leaves, which have inrolled margins and are dark green above and silvery white below. The greenish dioecious flowers appear before the leaves; the male flowers are in axillary clusters, the female flowers in short, few-flowered racemes. The flowers are covered with brownish scaly hairs. The fruit is bright-orange, ovoid and drupe-like. It is considered poisonous in some parts of Europe.

Habitat

Sea Buckthorn has a scattered distribution in Europe on dry, sunny slopes. In the British Isles it grows on fixed sand dunes and occasionally on sea cliffs,



Hippophae rhamnoides

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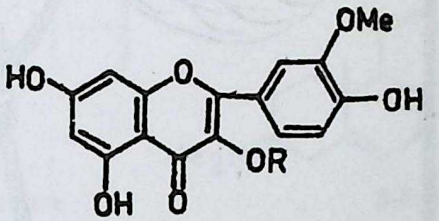
mostly on eastern and southeastern coasts. It is also grown in parks and gardens for ornament. In Greek, *hippophaes* means a spiny plant and this word gave rise to the generic name in Latin, *Hippophae*. The origin of the Greek word is not as straightforward and there have been several explanations for it. It is said that the ancient Greeks fed buckthorn berries to horses, which then acquired a gleaming coat (*hippos* = horse; *phaeithon* = shining). Or the name could refer to the belief that the plant cured blindness in horses ('it gave them light'; the Greek word *phaino* = light). There has also been a suggestion that the suffix '*phaes*' in the Greek name comes from a word meaninig 'I kill', but this seems unlikely.

Constituents

Six flavonoids detected in extract of fresh berries by PC; two of these identified as isorhamnetin and kaempferol; isorhamnitol from fruits; serotonin isolated from bark; isorhamnetin, its 3-β-D-glucoside and 3-β-rutinoside isolated from berries; three other flavonoids isolated as crystalline mixture, found to be oligosides (glucose, galactose, arabinose, xylose and rhamnose) of quercetin and kaempferol; carboline alkaloids–harmolol, tetrahydroharman and harmine–from roots.

New Compounds



Isorhamnetin glucoside
R = Glu
Isorhamnetin rutinoside
R = Rutinose

Uses

The fruits are used medicinally as a tonic on the Continent. They contain organic acids, tannins, the flavonoid glycoside quercetin, provitamin A, abundant vitamin C and vitamins B complex and E. The freshly pressed juice from the berries is made into syrups and preserves and used both preventively as a protection against possible infection, particularly in late winter and early spring, and as a general tonic during convalescence, The constituents of the berries also strengthen i the eyesight and have an antisclerotic effect.

Holarrhena antidysenterica, Wall.

(Family: Apocynaceae)

Vernacular Names

Sans.–Kutaja, Kalinga, Vatsika, Girimallika, Sakra-sakan; *Eng.*–Kurchi, Conessi or Tellicherry Bark; *Fr.*–Ecoree-de codagapala; *Hind.*–Karchi, Kura; *Punj.*–Kewar, Kura; *Ben.*–Kurchi, Kureya; *Guj.*–Indrajavanu; *Mah. & Kon.*–Kuda (*dhavo*); *Bom.*–Pandhra-kura; *Tel.*–Kaka-kodise, Indravrakshamu;

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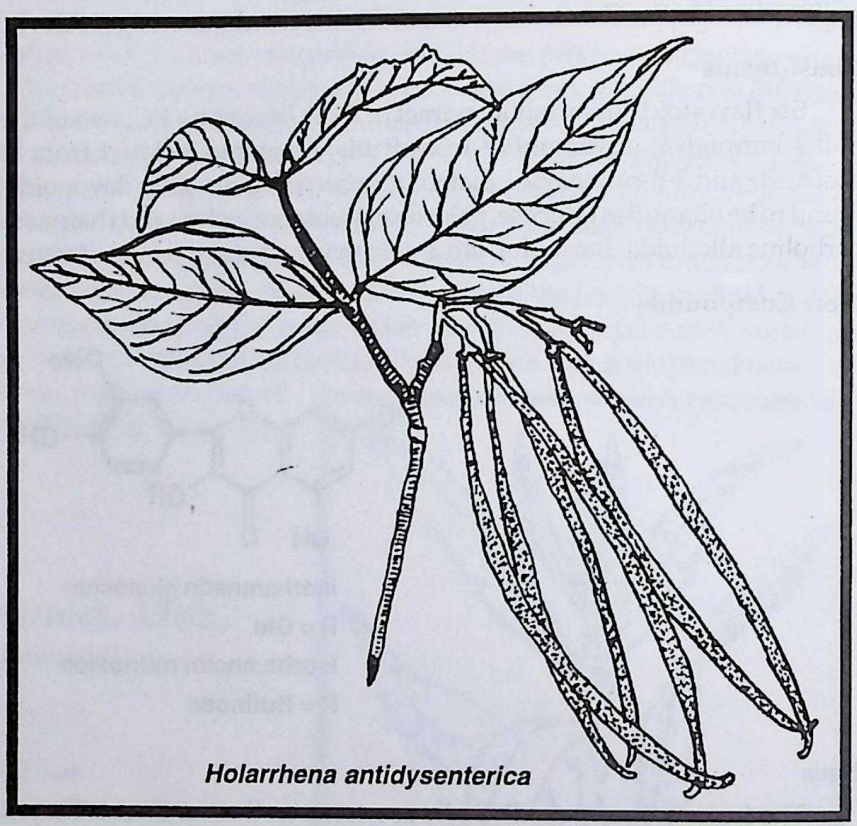
Tam.–Kashappu-vetpalarishi, Veppalai; *Can.*–Korasigina-gida; *Arab.*–Lisan-el-asafir-el-murr; *Pers.*–Zaban-i-gungishk-i-talk, Indar-javitalkh; *Port.*–Curo, Cura. (*The Seeds*):–*Sans.*–Indrayava (Indra's Seeds); *Hind. & Ben.*–Indrajab, Tita-indrajao; *Bom.*–Kurva-indrajao; *Tam.*–Kuluppalai-virai; *Pers.*–Indar-jave-talkh. (Three Apocynaceous plants are frequently called *kura, koda* or *kuda* in Indian Languages. H. antidysenterica, Wrightia tomentosa and Wrightia tinctoria, which is fraudulently substituted for the genuine Kurchi bark).

Habitat

This small tree is common in the forests of India, indigenous to the tropical Himalayas, Assam, U.P. down to Travancore. There are two varieties-white and black.



Holarrhena antidysenterica

Parts Used

Bark, seeds and leaves.

Constituents

Bark and seeds contain a non-oxygenated alkaloid–Wrightine or Conessine or Kurchisine and Holarrhenine. Wrightine or Conessine is an amorphous powder soluble in water and alcohol and in dilute acids. Holarrhenine crystallises from ethyl acetate in silky needles is insoluble in alcohol or chloroform. Kurchicine is a white crystalline substance; it is bitter to taste. Haines first isolated an alkaloid which he named 'conessine' from the commercial name of the bark–'conessi bark'. Ram Chandra Dutt isolated the total alkaloids which he named 'Kurchicine' after the Indian name of the plant. Wornecke isolated pure 'conessine' from the seeds. Conessine is an alkaloid from the seeds, m.p. 125°. ($C_{24}H_{40}N_2$ empirical formula). It contains two tertiary Nme groups. Some derivatives of Conessine are: Apoconessine ($C_{22}H_{33}N$) m.p. 68.50°; (hydrochloride, hydrobromide, hydrogen sulphate, m.p. 107.8°; picrate m.p. 100°-111°; methodide, m.p. 283°-285°). Dimethosulphate of conessine (m.p. 240°-242°) yields a hygroscopic base, $C_{26}H_{44}N_2$ (dipicrate, m.p. 258°-259° decomp), and dimethiodide.

The content of alkaloids in the bark is found to be about 1.2%; and 0.025% in the seeds and 0.22% in the bark. Ghosh have shown that, besides conessine, there are two other alkaloids present which have been designated as *Kurchicine* and *Kurchine* respectively. The alkaloid termed *Kurchine* is characterised by having a low melting point 75°C. and it is the most abundant alkaloid present in the bark. Ghosh isolated the alkaloids *Kurchicine* and *Kurchine* in a pure state. They have made a detailed study of the chemical composition of the free bases and of many of their important salts; *Kurchine*, the

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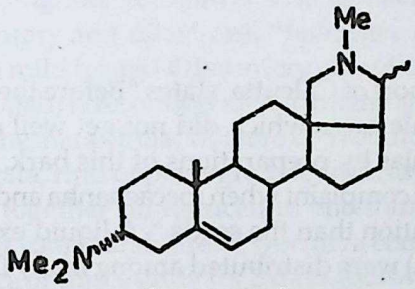
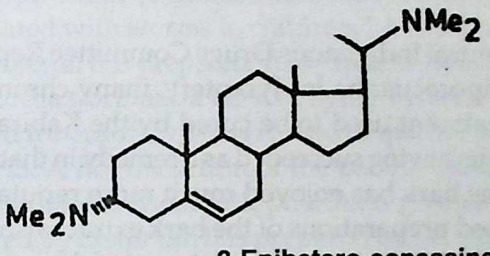
base which occurs in the largest amount, is shown to have the formula $C_{23}H_{38}N_2$ and *Kurchicine* is shown to have the formula $C_{20}H_{36}ON_2$. They are thus different from conessine and *holarrhenine* found in Africa.

Synthesis of conessine from cholesteryl toluene p-sulfonate; concuressine, mp. 86°, 3-epihetero-conessine, mp. 146°, and kurcholessine, mp. 219°, isolated after methylation of alkaloid mixture; structures of conkurchine (irehline) and kurchamine further substantiated by chemical studies; kurchimine also isolated; a new digitenol glycoside–holadysone, mp. 207°–characterised as 11α,20-dihydroxy-18,20-epoxypregna-1,4-dien-3-one; kurcholessine isolated after methylation of total basic fraction and structure elucidated; O-free alkaloids (conessine, conimine), conkurchine group alkaloids (including conessidine) and O-containing alkaloids (holarrhenine, holafrine, holarrhetine) present in bark whereas leaves contain O-containing alkaloids (kurchiphyllamine and kurchiphylline).

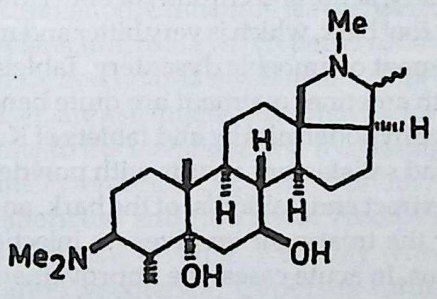
New Compounds



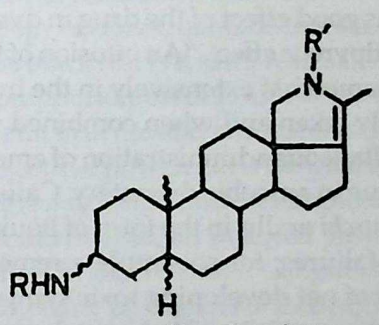
Concuressine



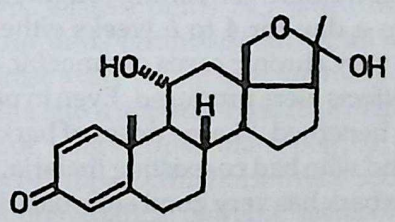
3-Epihetero-conessine



Kurcholessine



Kurchamine
R = H, R' = Me
Kurchimine
R = Me, R' = H



Holadysone

Evidence presented for presence of N-demethylated conessines in total alkaloidal fraction from plant; a new cardenolide–mitiphylline–was characterised as 3β-(4-deoxy-4-methylamino-β-D-cymaropyranosido)-14β-hydroxy-5β-card-20(22)-enolide.

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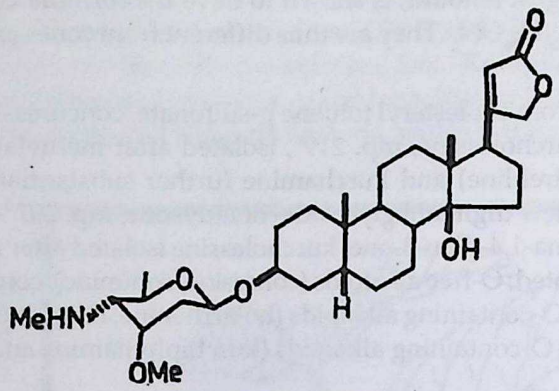
New Compounds



Mitiphylline

Uses

The Central Indigenous Drugs Committee Report of Calcutta, states "Before the discovery of the efficacy of ipecacuanha in dysentery, many chronic cases which did not get well under European medical treatment used to be cured by the Kabirajas by preparations of this bark. Cases have also occurred of its having succeeded as a remedy in that complaint when ipecacuanha and other medicines failed." "The bark has enjoyed much more reputation than the seeds." A liquid extract of the bark (standardised preparations of the bark extract also) were distributed among many Doctors for using and testing their efficacy in the treatment of dysentery. Almost all of them are unanimous in testifying to the marvellous good effect of the drug in dysentery, acute and chronic, of both children and adults, and also to its antipyretic effect. "An infusion of the root bark, which is very bitter and most unpalatable, has been tried somewhat extensively in the treatment of amoebic dysentery. Tablets made from the bark can be easily taken and when combined with emetine treatment are quite beneficial. Knowles found that simultaneous administration of emetine hypodermically and tablets of Kurchi bark orally is of marked value in amoebic dysentery. Caius had satisfactory results with powdered whole bark. Knowles tried *Kurchi* orally, in the form of liquid extract and 'tabloids' of the bark, and the cures were far higher than failures; for so simple a remedy the treatment involves no injections and has the additional merit of not developing toxic symptoms. In acute cases, the improvement was less rapid than emetine, but cure appeared to be much more permanent. Col. Chopra used a standardised extract made from the bark which is on the market (one drachm–4.0 c.c. containing roughly half to one grain of the total alkaloids) in doses of 2 drachms 3 times a day for 4 to 6 weeks either by itself or in combination with *Plantago ovata*, in the treatment of very chronic cases of amoebic dysentery, with benefit. No untoward symptoms or cumulative toxic effects were produced. Even in patients suffering from bacillary dysentery the symptoms are markedly benefited. "Large doses of bark extracts as well as of the alkaloids given in amoebic dysentery cases, and who had co-existing malaria, have disproved the firm belief existing in the United Provinces that the bark has very good anti-malarial properties; in none of these cases was any effect produced either in the clinical symptoms of the disease or on parasites in the blood." *Bark* of the stem and root, preferably of the young plants and the seeds, are generally used as remedies in acute and chronic diarrhoeas and dysentery. Seeds are given in powder in 30 to 60 grain-doses mixed with sugar-candy, 1 drachm. A *fluid extract* of the bark with the addition of ginger and *atis* is recommended in Chakradatta and according to Sharangdhara the *expressed juice* of the bark is given with honey. "A compound decoction and a confection prepared from the bark and

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the seeds, are often given in dysentery with beneficial results." *Seeds* enter into the composition of many prescriptions for bilious affections, fever, bowel-complaints, (dysentery, diarrhoea, flatulence), piles, intestinal worms, etc. Following recommended in Sharangdhara are a few illustrations:

1. Take of *Indrayava* seeds and the tubers of Cyperus rotundas, each four tolas, rub them into a paste with water and boil in one seer of water till the latter is reduced to one-fourth. This boiled emulsion is given in doses of about half to one ounce with honey.
2. A decoction of *Indrayava* seeds made with milk in usual proportions is used for checking bleeding from Piles (haemorrhoids). It is given with the addition of ginger. "Leaves are used as fodder in certain parts of the Punjab."

A decoction made by boiling 1 to 3 drachms of the seeds in 12 ounces of water till it is reduced to 4 ounces and straining, given in one dose in the mornings is most useful in chronic dysentery and in bleeding piles also. A decoction of *Kutaja* and *bael* fruit is beneficial in mucous diarrhoea with blood. The drug is generally combined with *mocharas* and similar drugs to act beneficially in acute and chronic dysentery and diarrhoea. "*Indrayava* powdered or infused in warm water, has been found very useful in mild forms of dysentery complicated with worms in children." A compound decoction called *Kutajashtaka* is recommended in Sharangdhara. It is prepared thus– Take of *kutaja* bark, *atis*, root of Stephania hernandifolia, flowers of Woodfordia floribunda bark of Symplocos racemosa, root of Pavonia odorata, rind of pomegranate fruit, and tubers of Cyperus rotundus quarter tola each, water 32 tolas; boil together till reduced to one-fourth. A hot decoction of the bark is used as a gargle in toothache. For round and thread worms, a compound anthelmintic powder is given in doses of 15 to 20 grains twice or thrice daily for 3 days followed by castor oil. It is prepared by taking 6 tolas each of Holarrhena seeds, seeds of Butea frondosa and Embelia ribes and 2 tolas each of Cardamoms (large), long pepper, Cinnamon, Cinnamon leaves, ginger, pepper, borax, bamboo manna, long pepper, root of Plumbago zeylanicum; tubers of Cyperus rotundus, black salt (vit salt), rock salt, Piper aurantiacum, Chebulic, beleric and emblic myrobalans. Other compound powders known as *Gangadhara Churnas* (*Lagu* and *Brihat*, are astringent intestinal tonics useful in acute and chronic dysentery and diarrhoea also giving tone to the intestines and increasing digestive power. *Lagu Gangadhara Churna*–Seeds of Holarrhena antidysenterica, Cyperus rotundus, Aegle marmelos, bark of Simplocos racemosa, gum of Bombax malabaricum and flowers of Woodfordia floribunda, all in equal parts, powder and mix. Dose is 20 to 40 grains given thrice a day with whey. *Vridha* or *Brihat Gangadhara Churna*–Seeds of Holarrhena anti-dysenterica, Cypersus rotundus, Bark of Bignonia indica, Zingiber officinale, Woodfordia floribunda, Simplocos racemosa, Andropogon muricatus, Aegle marmelos, Bombax malabaricum, Cissampelos hernandifolia, Kernel of seeds of Mangifera indica, Aconitum heterophyllum, and Nymphae stellata, all in equal parts, powder and mix. *Dose*: 20 to 40 grains to be taken three times a day with whey. Another compound powder called *Pathadya Churna* is recommended by Chakradatta and it is made thus: Take of the root of Stephania hernandifolia, fruit of Aegle marmelos, plumbago root, long pepper, black pepper, ginger, bark of Eugenia jambolana, rind of pomegranate fruit, flowers of Woodfordia floribunda, root of Picrorrhiza kurroa, *atis*, tubers of Cyperus rotundus, wood of Berberis asiatica, chiretta, seeds of Holarrhena antidysenterica, one part each, *kutaja* bark, equal in weight to all the above ingredients; powder them finely and mix. *Dose*: about one to two scruples to be taken with rice-water and honey. *Kuta-jaarishta* (Fermented decoction of Holarrhena antidysenterica) is a preparation used as astringent, stimulant and antiperiodic given in chronic diarrhoea, dysentery, colitis and sprue and continued fevers. Dose is ½ to 2 tolas. It is prepared by taking 12½ seers of the root bark of Holarrhena antidysenterica, 6¼ seers of raisins, 80 tolas each of flowers of Bassia latifolia and the bark of Gmelina arborea, boiling them together in 256 seers of water

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till reduced to 64 seers, and strain; then add 2½ seers of the flowers of Woodfordia floribunda and 12½ seers of treacle and let the mixture ferment for a month, after which it will be ready for use. Another preparation is a compound decoction known as *Kalingakadi Kvatha*, of which the chief ingredients are the seeds of Holarrhena antidysenterica, Trichosanthes dioica and Picrorrhiza kurroa; it is useful as bitter tonic and antiperiodic, given in ½ to 1 ounce-doses twice daily, in fevers, especially those complicated with liver derangement. A *confection* called *Kutajaleha* and recommended by Chakradatta is prepared thus: Take of kutaja bark 12½ seers, water 64 seers, boil down to 16 seers and strain. Boil the strained decoction till reduced to a thick consistence, then add sanchal salt, *Yavakshara, vit salt*, rock salt, long pepper, flowers of Woodfrodia floribunda, *indrayava* seeds and cumin seeds each 16 tolas, in fine powder, and prepare a confection. Dose is about a drachm with honey in chronic and acute dysentery. Another confection known by the name of *Pradarari Lauham* and recommended in Bhashjyaratnavali for cases of menorrhagia and other uterine discharges is prepared thus: Take of 12½ seers of *Kutaja* bark, and prepare a fluid extract as in the preparation called *Kutajaleha*, above described. Then add the following substances in fine powder, *viz*: gum of Bombax malabaricum, Indian madder, root of Stephania hernandifolia, *bela* fruit, tubers of Cyperus rotundus, flowers of Woodfordia floribunda, *atis*, prepared talc and iron each 8 tolas, mix them - intimately and prepare a confection. Dose is about a drachm. Persian writers prescribe the seeds in powder with honey in chronic chest affections such as asthma due to worms and also in colic. An oil for external application called *Grahan-i-mihira taila* is prepared with Sesamum oil, decoction of Holarrhena bark and a number of astringent and aromatic substances in small quantities. Bark is used also as *Lep* or plaster applied in rheumatism, and over the part of the abdomen which is most painful. They are also useful applications in pruritus, bad ulcers etc, Arabian and Persian writers "consider the seeds valuable in pulmonary affections" and also recommend *pessaries* made of the *Indrayava* seeds, honey and saffron; they are supposed to favour conception. They are also used after delivery to give tone to the soft parts. "In the laboratory and clinically, the total alkaloids obtained from H. antidysenterica bark have a most remarkable action against acute and chronic forms of amoebic infections of the gut. In acute amoebic dysentery, intramuscular injections of 1 grain of total alkaloids produce a cure at least as quickly as emetine. In chronic cases 10 grains of the alkaloids twice daily for 10 days eradicate the infection in a large number of cases. In very persistent cases, a course of 15 to 20 days is given according to the severity of the case. Such prolonged use produces no toxic effects and untoward symptoms.

A Bismuth Iodide Compound of *Kurchi* alkaloids, promises to be a valuable treatment for chronic amoebic affections of the bowel, particularly in the tropics.

Following are a few additional useful Home Remedies:

1. Take of seeds of Holarrhena antidysenterica 5, Cyperus rotundus 4, Symplocos racemosa 5, Bael Fruit 5, Bombax malabaricum 3, flowers of Grislea Tomentosa 4 parts. Mix and make a powder. *Dose*: ½ dr. Used in bowel complaints and dysentery.
2. Take of the bark of Holarrhena antidysenterica 2 drs. Bael fruit 2 drs., Pomegranate bark (dried) 1 dr, Rub them together into a fine powder. *Dose*: 20 to 40 grains. Vehicle–Honey or syrup. Used in diarrhoea and advanced stages of dysentery.
3. Take of the bark of Holarrhena antidysenterica 5 and Sugar 5 parts. Mix and boil with water till reduced to a syrupy consistence; then add Carbonate of potash 2, *Pancha lavana* (Rock salt, Common salt, *Goda lavana i.e.* sweet chloride of sodium, *Sanchal salt & Bida lavana* or vit salt) 2, dried slices of the root of long pepper 3, flowers of Grislea tomentosa 4, seeds of Holarrhena antidysenterica 4, and Cumin seeds 4 parts, and make a fine powder. *Dose*: 1 drachm. Vehicle–Syrup. Used in acute and chronic dysentery.

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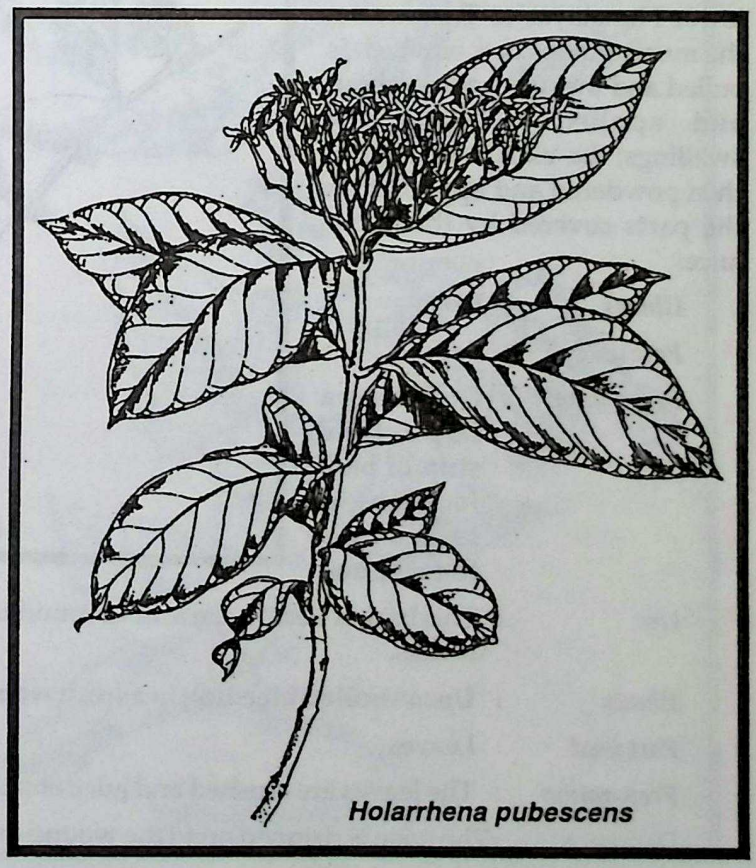
4. Take of the bark of Holarrhena antidysenterica 5, Bombax malabaricum 3, Rubia cordifolia 2, Cissampelos pareira 3. Bael fruit 5, Cyperus rotundus 6, flowers of Grislea tomentosa 6, Mica 2, and *Lahuna sara* 4 parts. Mix and make a powder. *Dose*: 10 to 15 grains. Used in menorrhagia and other uterine discharges.
5. Take of Holarrhena antidysenterica seeds 5, long pepper 4, dried slices of the root of long pepper 4, Solanum jacquini 3 and Apium graveolens 4 parts. Mix and make a powder. Dose is 10 to 15 grains. Used to check vomiting, and in dyspepsia.
6. "The seeds of Holarrhena antidysenterica are a never falling specific for dysentery and hemorrhoidal flux. Take of the powdered seeds ½ dr., sugarcandy 1 dr., cold water 1 ounce: to be kept for a few houses and then strained with a thin muslin cloth: the result is a white mucilaginous bitter infusion, which is to be given twice or thrice a day to an adult; for children the dose is proportionate to their age. If the infusion be prepared in large quantity, in the proportions mentioned, it will keep fresh for many days."
7. "Another specific property of these seeds is its efficacy in jaundice. Take of powdered *Inderjav* seeds dr. ½, powdered root of Heileborus niger grs. 20, pure water ozs. 3; to be boiled or made into a decoction, and either Sulphate of Magnesia drs. 2 to 4 or sulphate of Soda drs. 2 to 4 to be added when cool; this decoction is to be given early in the morning for 3 days at least, to patients suffering from jaundice caused by portal congestion, obstruction and inflammation of the gall-ducts, worms, cold, etc. With the above decoction can be given during the day a simple mixture of taraxacum and ammonium chloride."

Holarrhena pubescens
(Family: Apocynaceae)


Holarrhena pubescens

Habitat

It has been the most widely accepted source of the drugs *kutaja* and *indrayava* throughout the country. But some species of the closely related genus *Wrightia*, have also been accepted as the botanical source in some parts. However, doubts about this choice have been expressed and have unequivocally stated that *Holarrhena pubescens* is the right choice for *kutaja* and that *Wrightia tinctona* and *W. arborea* might be considered as the sources of *strikutaja* or *krsnakutaja*.

Uses

Kutaja is a reputed single drug remedy for chronic dysentery and

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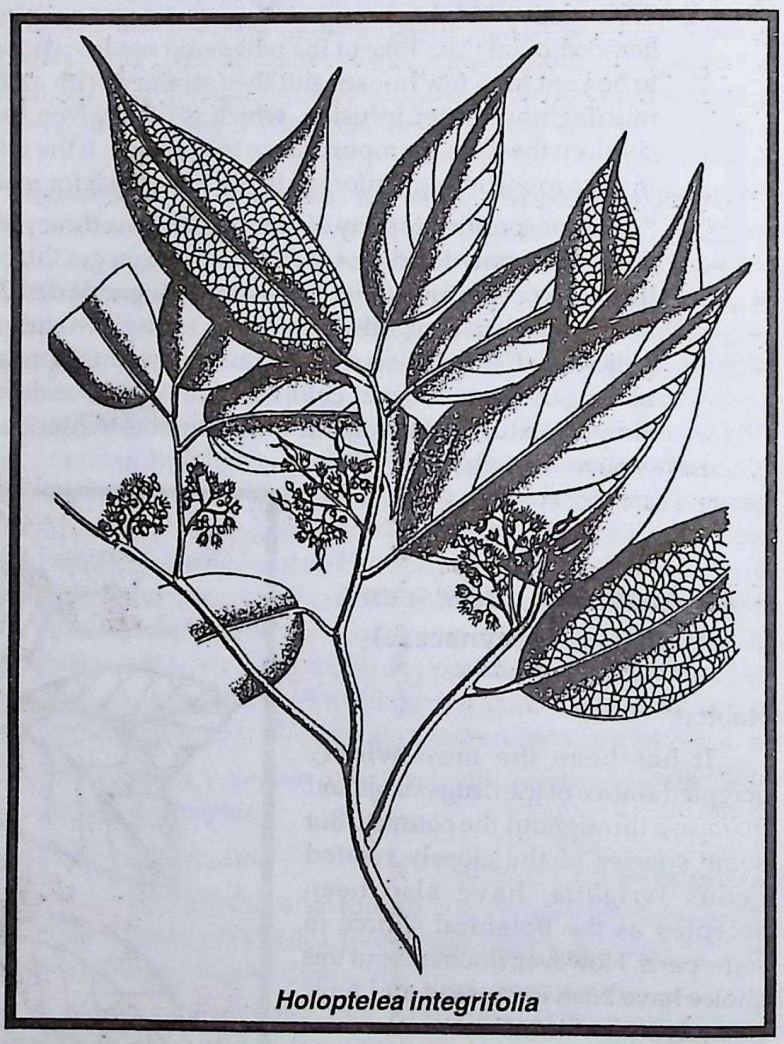
diarrhoea. The officinal parts are the root bark and seeds. The root bark-is bitter, astringent cooling in action and carminative. It cures piles, diarrhoea, haemorrhage indigestion and skin diseases. It is also reported to be useful in heart diseases, fever, *vatarakta, visarpa,* vomiting and disorders due to the morbidity of *tridosas.* The seeds known as *indrayava, bhadrayava,* etc. are considered to be astringent, febrifuge, anthelmintic and alleviative of all the three *dosas* and cure bleeding piles, diarrhoea and colic. *Kutajaristam, Kutajalvagadi leham, Ayaskrti* etc. are some of the preparations using the drug.

Holoptelea integrifolia, Planch.
(Family: Urticaceae)


Holoptelea integrifolia

Vernacular Names

Hind.–Papri, Pipri; *Mah.*–Vavala; *Tel.*–Navili; *Tam.*–Aya; *Can.*–Rasbija.

Botanical Description

It is a tree extending from the lower Himalayas to Travancore, the mucilaginous *bark* of which is boiled and the *juice* squeezed out and applied to rheumatic swellings; the exhausted bark is then powdered and applied over the parts covered by the sticky juice.

Illness : **Fever**

Part used : Bark

Preparation : On Sunday a rope-like strip of bark foot long is removed from the tree.

Use : This bark is tied on the arm or round the neck in the morning and kept on till it breaks.

Illness : **Uncontrolled bleeding in a fresh wound**

Part used : Leaves

Preparation : The leaves are crushed and juice obtained.

Dosage : The juice is dripped on to the wound once only.

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Holostemma ada-kodien

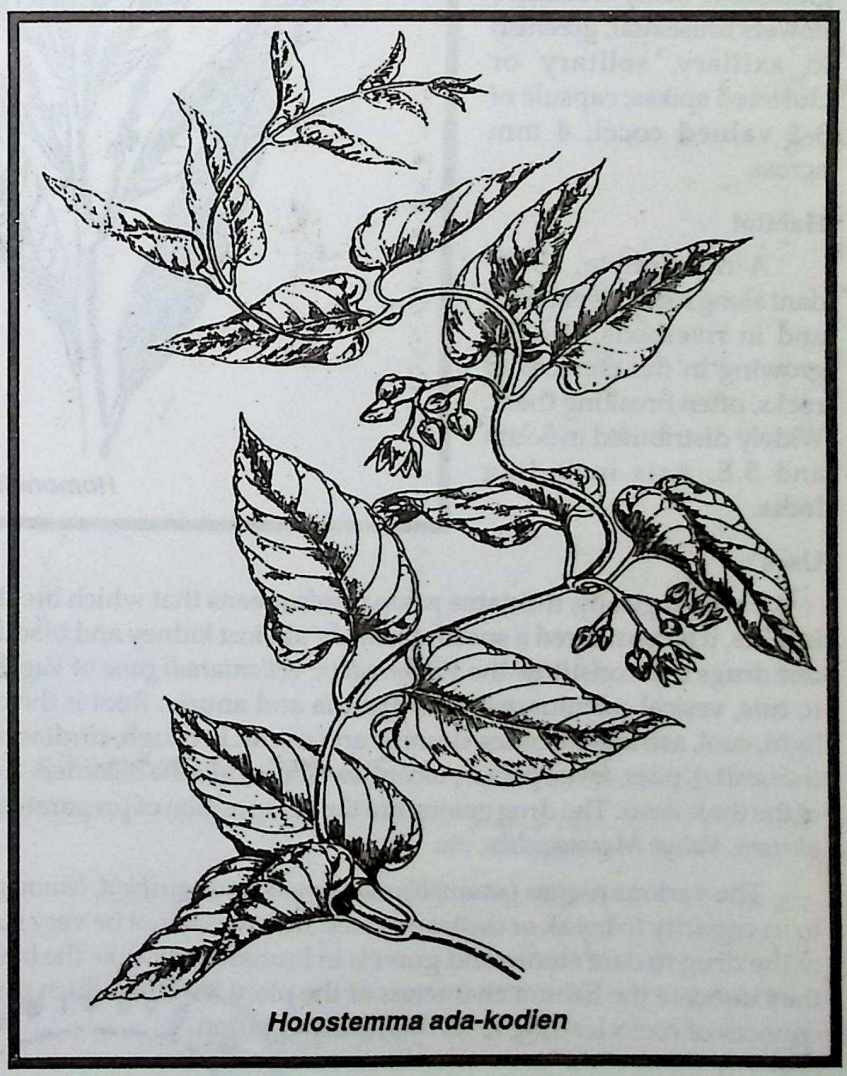
(Family: Asclepiadaceae)

Botanical Description

Large, perennial, laticiferous climber; stem slightly reddish, glabrous; leaves simple, opposite, ovate or ovate-oblong, entire, acute, deeply cordate at base, 4-6 × 2-3.5 cms, chartaceous, puberulous below; flowers large, crimson-pink in axillary cymes; calyx deeply 5-partite, lobes broadly ovate-obtuse; corolla gamopetalous, deeply 5-lobed, subrotate, pinkish outside and purplish within; stamens 5, adnate to the base of the corolla tube, the filaments cohering in a tell-winged column; pistil bicarpellary, ovaries free, style slender, ending in an oblong 5-winged stigma; follicles lanceolate.

Habitat

The plant has been recorded as occurring in the tropical Himalayas, Dehradun, Konkan, Bombay, Deccan, N. Circars, Canara, Carnatic, Kerala and Kanyakumari district. It grows over hedges and in open forests especially on the lower slopes of the hills. Also distributed in Sri Lanka, Burma, W. China.



Holostemma ada-kodien

Uses

As the name *jivanti* other synonyms like *jivani, jiva, jivaniya, jivada,* etc. indicate, the drug is considered to have the property to bestow health and liveliness to the consumer. Caraka treats it as an important *rasayana* drug, capable of maintaining the youthful vigour and strength and Vagbhata includes it among the ten drugs that constitute the *Jivaniya gana* or the vitalising group.

Jivanti is cold, sweet, aphrodisiac, rejuvenative and easy of digestion. It promotes health and vigour, improves voice, alleviates the three *dosas-vata, pitta* and *kapha* and cures eye diseases, haemetemesis, emaciation, cough, dyspnoea, fever and burning sensation. Dysentery, nightblindness, poisonous affections and

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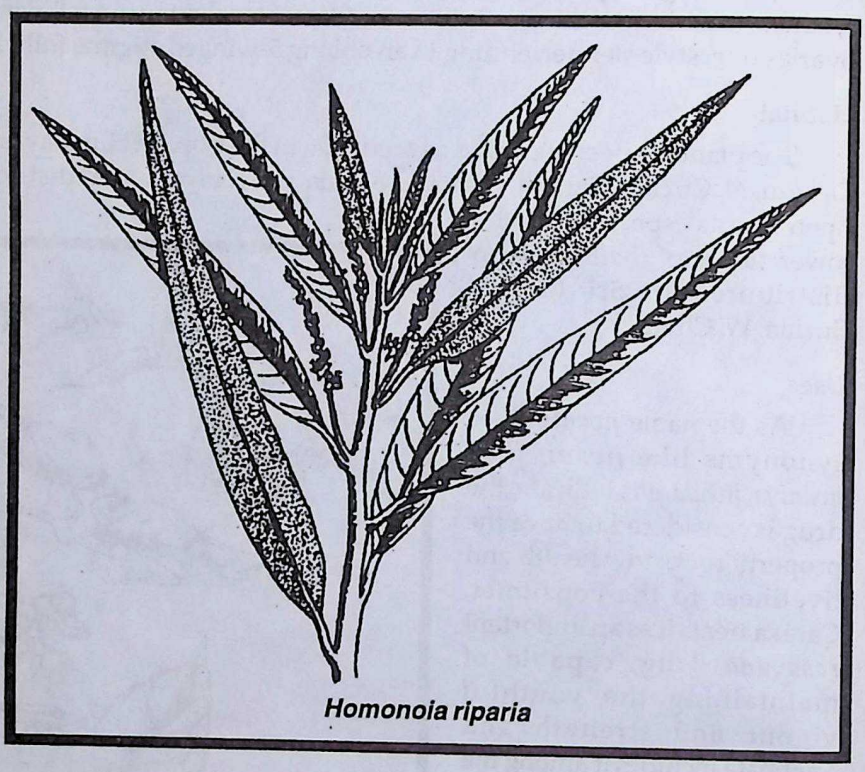
tuberculosis are also relieved by the use of the drug. The root, which is the officinal part, enters into the composition of preparations like *Jivantyadi ghrtam, Manasamitravatakam, Balaristam, Anutailam*, etc.

Homonoia riparia
(Family: Euphorbiaceae)

Botanical Description

Woody herbs or shrubs with fibrous stems; leaves spiral linear or lanceolate, acute, upto 25 × 2 cm, entire or serrulate, glabrous, glandular-scaly beneath; flowers unisexual, greenish in axillary, solitary or clustered spikes; capsule of 3-2 valued cocci, 4 mm across.



Homonoia riparia

Habitat

A rhoeophyte, abundant along rocky river banks and in riverbeds, usually growing in the crevices of rocks, often breaking them. Widely distributed in South and S.E. Asia including India.

Uses

Erymologically, the name *pasanabheda* means that which breaks or destroys stones. As the name implies, it is considered a specific remedy against kidney and bladder stones. This is one of the twenty one drugs that constitute the *Virataradi* or *Vellantaradi gana* of *Vagbhata* which eradicates diseases due to *vata*, vesical calculus, gravels, dysuria and anuria. Root is the officinal part and is reported to be light, cool, astringent, bitter, diuretic and useful in cough, cardiac disorders, dysuria, blood disorders (*raktapitta*), piles, fever, poison, ulcers, swellings, uterine disorders and diseases caused by the morbidity of the three *dosas*. The drug enters into the composition of preparations like *Putikaranjasavam, Traikantaka ghrtam, Valiya Marmagulika*, etc.

The various names (*pasanabhedah, asmaghnah, giribhid, bhinnayogini*) attributed to this drug refer to its capacity to break or destroy stones. But one cannot be very sure whether they refer to the ability of the drug to cure stones and gravels in human body (like the bladder stones, kidney stones etc.) or they indicate the habitat characters of the plant itself, in which case it should be one which grows in crevices of rocks leading to its final disintegration.

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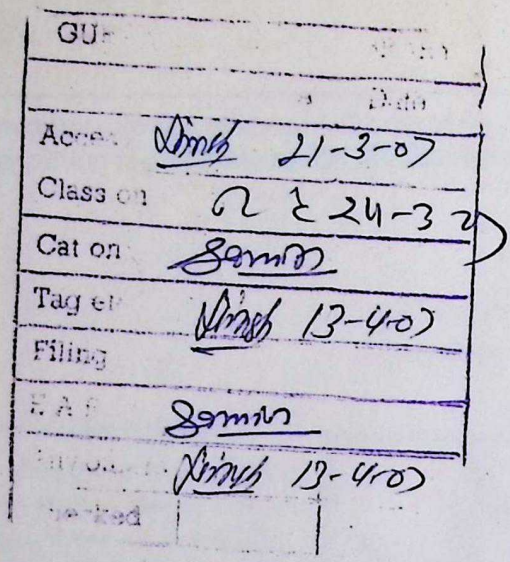

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